the OIL AND GAS JOURNAL

,300,000 BARRELS, PENNSYLVANIA'S CRUDE OIL PRODUCTION FOR FIRST SIX MONTHS OF 1944

ginning with the completion of the us Drake well at Titusville, crude as been produced commercially in sylvania since 1859. Oil was struck is well on August 28 of that year, depth of 69½ feet, and its daily ut amounted to about 25 barrels. to the high price of crude (about per barrel at that time), the success e Drake well stimulated intense ac-, and by the end of 1860, 117 had been drilled, 73 of which were ucers.

The history of our Oil Industry dates from the Drake well, and from 1859 to 1895 Pennsylvania led the states in the production of crude. In producing 7,300,000 barrels of high grade crude during the first six months of 1944, Pennsylvania holds an important place among the oil producing states today.

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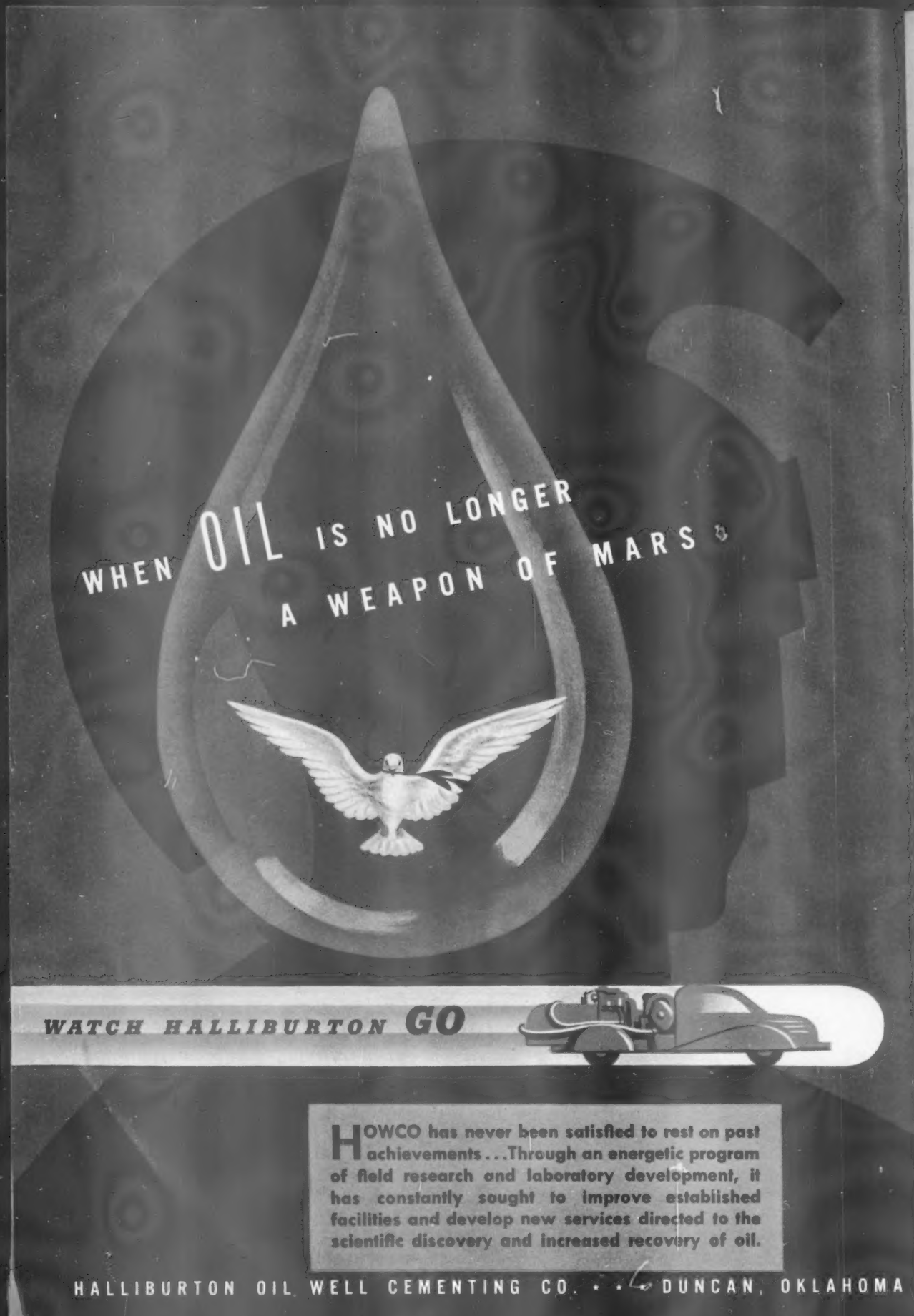
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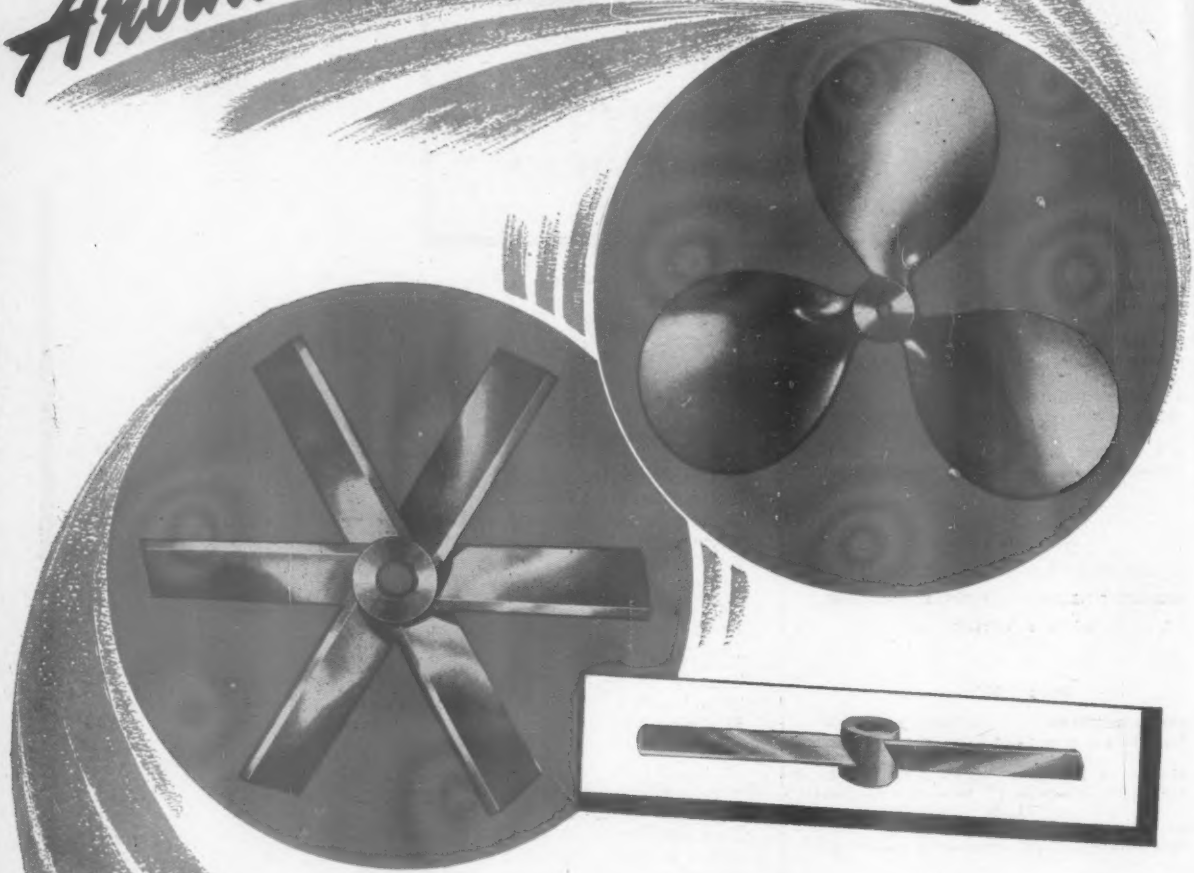

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Trends

Crude-Oil Production
By States — Page 96

CRUDE-OIL STOCKS 222,575,000 bbl. as of December 23—up 500,000 bbl. One year ago 241,310,000 bbl.

GASOLINE STOCKS 83,365,000 bbl. as of December 23—up 618,000 bbl. One year ago 73,019,000 bbl.

RESIDUAL FUEL-OIL STOCKS 58,509,000 bbl. as of December 23—down 771,000 bbl. One year ago 57,036,000 bbl.

GAS OIL AND DISTILLATE STOCKS 40,846,000 bbl. as of December 23—down 1,567,000 bbl. One year ago 43,033,000 bbl.

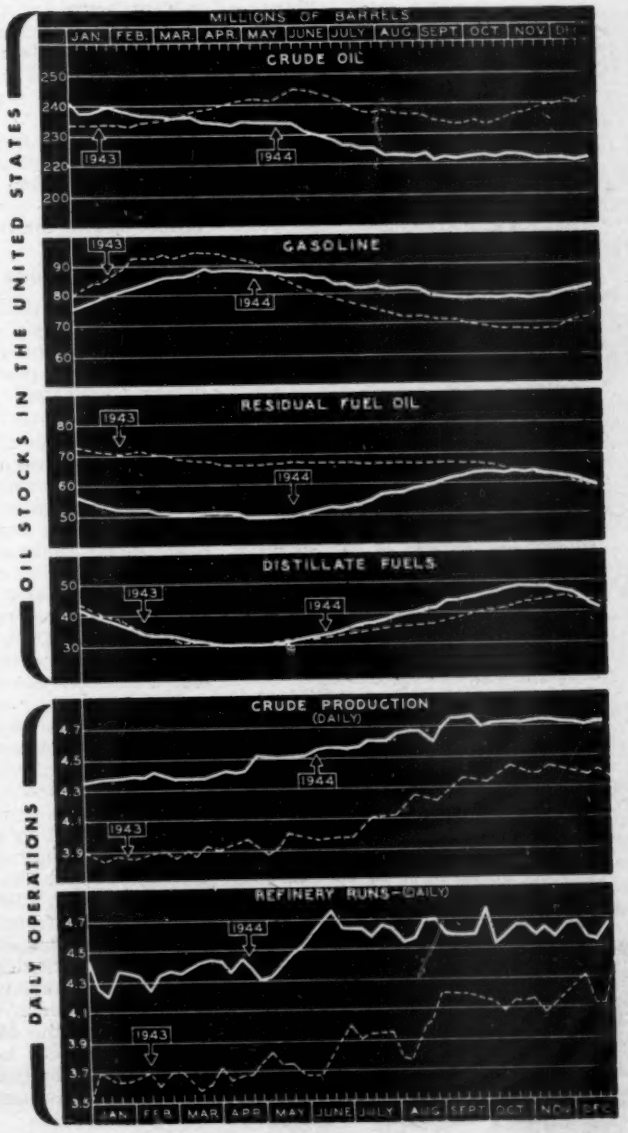
CRUDE OIL PRODUCTION 4,714,350 bbl. as of December 30—down 7,200 bbl. One year ago 4,364,650.

REFINERY RUNS 4,682,000 bbl. daily week ended December 23—up 145,000 bbl. One year ago 4,204,000.

A REPORT this week by the Fuels and Lubricants Division of the Office of Quartermaster General covering the Army's consumption in the United States should serve to end misstatements and conjecture regarding this phase of petroleum demands. Exclusive of the demands for aviation gasolines, which cannot be released for military reasons, the report shows an average daily consumption of 72,420 bbl. for the 6-month period (April to September 1944) divided as follows: 80-octane gasoline, 2,680; other gasoline, 29,140; kerosene and solvents, 1,430; diesel fuel oil, 3,040; other distillate fuel oils, 6,780; residual fuel oils, 25,810; lube oils and greases, 1,790; asphalts, 1,270; all other products, 480. The report explains that it is not expected that later figures will show any changes in consumption trends except seasonal increases in distillate demand to 17,500 bbl. daily and residual fuels to 35,100.

ONE of the obvious objectives of the data is to show that the Army is not wasteful in its use of petroleum products and that its consumption at posts, camps, stations, ports, depots, manufacturing plants, construction projects, and other activities in this country is small compared with civilian demands. It is pointed out that Army consumption within this country, exclusive of aviation gasoline, is approximately 1.5 per cent of the current domestic output of liquid petroleum. In the case of gasoline the average use per soldier is 10 gal. monthly, which compares with an A ration of 8 gal. for civilians. The low consumption of 80-octane gasoline is stressed, with the explanation that its use in this country is confined to tactical equipment and to situations where it is necessary to duplicate battle conditions.

THE report negates statements in regard to large Army petroleum storage in the United States exclusive of that scheduled for foreign use. While the exact storage is not given, the report shows the following inventories, the figures indicating days' supply: 80-octane gasoline, 17; other gasoline, 10; kerosene and solvents, 20; diesel fuel oil, 19; other distillate fuel oils, 25; residual fuel oils, 20; lube oil and greases, 51; average all products, 18. It is explained that these stocks are closely checked and are quickly liquidated when they become excessive through curtailment in purchases and through transfer from one area to another.



Double-Barreled Attack Is Launched on Crude Ceilings

by Henry D. Ralph

WASHINGTON. — A double-barreled attempt to obtain an increase in crude-oil price ceilings got under way here this week, with the possibility that the two might cross each other up and delay the final result.

The Office of Price Administration sent invitations to 21 representative crude producers asking them to serve on nation-wide industry advisory committee to assist in making a study of the costs of producing crude oil with a view to possible increases in OPA price ceilings.

The Independent Petroleum Association of America simultaneously circulated its members with a request for power of attorney to file a protest with OPA against present ceilings, taking advantage of a legal quirk in OPA procedure which heretofore has operated to prevent OPA from considering crude prices on a national basis.

The I.P.A.A. move, according to Russell B. Brown, general counsel, is designed to speed up OPA's consideration of the crude-price request and to give the new advisory committee something concrete to work on.

However, some OPA officials take the view that this might complicate the subject and result in delay. Under the procedure proposed by I.P.A.A., a formal protest must be acted on by OPA within 30 days. Unless the protest is accompanied by cost data which OPA considers sufficient to justify final action, the protest would be returned to I.P.A.A. with a request that it conduct a cost survey of the industry and analyze the figures at its own expense. While this is going on, it is said, OPA and its advisory committee might be stopped from further consideration of crude prices.

This possibility is discounted by Brown, who says there are various ways of coordinating the two procedures and there is no need for a conflict unless OPA chooses to use technicalities as a means of delaying consideration of crude prices.

Nominations for membership on the producing industry advisory committee were asked by OPA from the I.P.A.A., American Petroleum Institute, Petroleum Industry War Council, and National Stripper Well Association. From these lists OPA is selecting 21 individuals, and as soon as acceptances are received the committee will be formally named and asked to meet in Washington as soon as possible, probably January 15.

A plan for ascertaining the cost of producing crude will be laid before the committee at its first meeting. OPA has drafted a cost questionnaire form and a method of obtaining a representative sample of the industry. The study will not be undertaken, however, until OPA has assurance from the committee that the industry will consider the sample representative and the cost form practical, complete, and capable of being answered by a sufficient number of persons.

The cost study made by the Tariff Commission for OPA was severely criticized by the industry as not being representative and not including the proper data. For that reason OPA wants full agreement on procedure before the new study is begun.

No Further Study?

Furthermore, OPA will stipulate that the study will not be carried through unless returns are received from a certain percentage of producers circularized, the percentage figure to be determined later.

Nominations are also being sought for membership on a refiners industry advisory committee, and this probably will be set up within 30 days. A refinery cost study will be made in the same manner, but because of the smaller number of firms in the business and the probability that costs figures can be obtained more promptly, OPA believes it may have its refinery cost study completed ahead of the crude-oil study in spite of the later start.

The I.P.A.A. questionnaire asks all producers to give power of attorney to Russell B. Brown, general counsel, and James V. Brown, petroleum analyst, to represent them individually in filing a protest with OPA against the present ceiling price of crude oil. The reason for this procedure is that OPA does not recognize protests from trade associations as the voice of industry but will accept a protest filed by an attorney for actual producers. If a sufficient number of producers join in the protest the Messrs. Browns can legally appear before OPA as spokesmen for the bulk of the crude producers of the country.

An average increase of 75 cents per barrel, varying with fields and grades, in present OPA crude price ceilings will be asked by the I.P.A.A. No new cost study will be made, but I.P.A.A. will present data already on hand which it claims show that the industry is suffering from low prices.

The proposed protest document cites the laws governing OPA as requiring action to increase crude prices on the basis of facts already at hand, but it also asks that OPA make a new cost study in cooperation with the industry advisory committee.

FPC Explains Purpose of Gas Investigation

WASHINGTON. — Basil Manly, chairman of the Federal Power Commission, this week declared that the commission's investigation of the natural-gas industry will not interfere in any way with producing states in the exercise of their authority over production and local distribution.

Statement of FPC policy was made in a letter from Manly to Gov. Andrew F. Schoeppel of Kansas, chairman of the Interstate Oil Compact Commission. Manly's letter was prompted by reports which representatives of the FPC made after attending the winter quarterly meeting of the compact in the role of observers. Manly explained that there appears to be a general misunderstanding over the purposes of the FPC investigation, known as Docket G-580.

"We wish to assure the representatives of all the gas-producing states," Manly wrote, "that the Federal Power Commission has no desire to extend its jurisdiction to cover the production of natural gas or otherwise invade what are properly regarded as the functions of the conservation authorities of the several states."

He explained that the commission had been urged by certain factions to arrest the inferior uses of natural gas. Other interests are equally insistent that FPC should exercise no restraint over interstate transportation and sale of natural gas. The commission, he asserted, is determined to develop facts to further natural-gas conservation.

Tyrola East Pool Added to Fields Receiving Subsidy

WASHINGTON.—The Tyrola East pool, Seminole County, Oklahoma, was added to the stripper well subsidy list this week, effective December 1, with a premium price of 25 cents, the petroleum branch of the OPA announced.

Bolivia Seeking Materials to Expand Petroleum Operations

WASHINGTON.—Materials for expansion of the oil industry of Bolivia are being sought in the United States currently by Guillermo Mariaca, acting general manager of Yacimientos Petroliferos Fiscales Bolivianos and chairman of the Bolivian section of the Bolivian-Brazilian Mixed Petroleum Commission.

Proposals for oil expansion have been under study for several years by the Bolivian Government, assisted by various experts sent by the United States Government during the war, and a definite program has been agreed upon. A loan of $5,500,000 from the Export-Import Bank has been available for some time, and development now depends chiefly on obtaining materials from this country.

Immediate plans call for cable-tool drilling equipment and supplies needed for a limited amount of wildcatting and to rehabilitate old wells and drill up proven fields.

Ultimately it is planned to build a refinery of 5,000-bbl. daily capacity at Santa Cruz, which will soon have rail connections with Brazil and highway connections with La Paz. Foster Wheeler Corp. is now making an engineering study of this refinery project. It is also proposed to connect the refinery with a 200-mile pipe line from the Camiri and Saipuru fields to the south.

Development Plans

The Bolivian development plan calls for Y.P.F.B. to confine its activities to its present operations south of the Parapeti River. The area north of this river will be developed by the Mixed Commission, and the governments of Bolivia and Brazil have each pledged $1,750,000 for this work. This area, lying east of the Andes, contains the most promising exploratory possibilities and also is expected to be the area of greatest growth and economic development in Bolivia. The northern section is reached by tributaries of the Amazon, while the central portion, near Santa Cruz, is being opened up by the Bolivian highway and the Brazilian railroad, both now under construction. The chief market in the near future probably will be southern Brazil.

The mixed commission plans to conduct wildcatting operations, probably by contract with private concerns. When a new field is discovered it will be sold or leased to a private corporation to be incorporated in Bolivia but which may have foreign capital. Income from these operations will be used by the mixed commission for further wildcatting or other petroleum development.

Of the many plans which were proposed, the Bolivian Government finally settled on a pipe line from Camiri to a refinery at Santa Cruz as the most feasible project at this time. One great difficulty has been that the Bolivian oil fields have been separated from the chief areas of petroleum consumption, so that the most important market was in Argentina while the La Paz area was supplied by imports from the Pacific. As a result, Bolivian production has never accounted for more than one-third of consumption of petroleum products. The rail-highway link across central Bolivia, now under construction, is counted on to supply Bolivian oil to most domestic markets and also to provide a considerable export market in Brazil.

Bolivian officials are confident that within a few years wildcatting operations will develop sufficient proved reserves in the Santa Cruz area to maintain the operation of a 5,000-bbl. refinery.

Present plans call only for two wildcat wells in the most promising areas between Camiri and Santa Cruz. The mixed commission plans to drill 29 additional wells in the Camiri field and 10 in the Saipuru field, while Y.P.F.B. plans considerable rehabilitation work, chiefly in the Barmejo field.

U.S. to Probe Removal of Equipment From Romania to Russia

NEW YORK.—The United States will send a technical expert to Romania to determine how much American-owned machinery has been removed from Romanian oil fields to Russia, according to reports considered authoritative. This expert will join Gen. Cortlandt Van Rensselaer Schuyler, United States member of the Allied Control Commission for Romania; Burton Berry, United States representative in Romania, and other investigators, in appraising the value of the machinery, which is said to include irreplaceable pumps. More than $1,000,000 worth of American oil equipment is estimated to be involved, besides British-owned equipment.

According to the New York Times, the United States and Great Britain have asked Russia to explain the removal of the equipment. The Russian Government, the Times says, has assured both Washington and London that it will respect American and British financial interests in the Romanian oil fields.

What has actually happened in the Romanian oil fields is not clear because the Russians have not permitted this country's representatives on the Allied Control Commission for Romania to go there. But it has been established that, when Marshal Rodion Y. Malinovsky's army reached the oil fields, orders were given to ship some of the equipment to Russia.

While all the companies owning equipment in this oil field operated under Romanian law before the war, most of them were controlled either wholly or in part by foreign capital. Standard Oil Co. (New Jersey) controlled Romania-Americana which produced about 15 per cent of the total annual prewar Romanian output of 5,000,000 tons. Royal Dutch-Shell Combine directed Astra Romana which produced 30 per cent of the total. Steaua-Romana, an English-French-Romanian company, produced 10 per cent. Unirea, a British company, produced 10 per cent. The Germans owned facilities producing about 23 per cent.

Matter Referred to Moscow

On the basis of Anglo-American financial interests in this oil field, and on the theory that the United States and Britain should be consulted about major decisions affecting not only the military situation but the postwar economy of Europe, the American and British representatives on the control commission took the question up with the Russian officials on the commission in Bucharest. The latter referred the question to their Moscow superiors.

When no satisfactory explanation was received, American Ambassador W. Averill Harriman and British Ambassador Sir Archibald Clark Kerr are said to have been instructed by their governments to take the matter up in Moscow. The ambassadors are understood to have argued not merely that the financial interests of American and British inves-

tors should be protected but that nothing should be done in the oil fields that would either reduce their output or minimize their importance in the economy of southeastern Europe.

The Russians are said to have replied that they would protect Anglo-American financial interests and would also use the Romanian fields in the interests of the general war effort. They are also understood to have explained that most of the equipment that they took out of the field was German and as such was a legitimate prize of war badly needed inside Russia to replace equipment destroyed in the German drive toward the Caucasian oil fields earlier in the war.

The Russians added that the Germans had started shipping oil-field equipment eastward toward the Caucasus to replace facilities destroyed by the Russians themselves in the fields in the region of Maikop. The strength of the Red Army's defense, however, was held by Moscow to have diverted the German equipment, bound for Maikop, into the Romanian fields and consequently, they concluded, orders were given to Marshal Malinovsky to ship it on to Russia, where it is needed.

Demand for Motor Fuel in January Virtually Static

WASHINGTON.—Demand for motor fuel in January will total 61,000,000 bbl., including an addition to stocks of 3,300,000 bbl., the Bureau of Mines reported here this week in its regular monthly forecast of petroleum requirements prepared under the supervision of A. G. White, chief, petroleum economics division. December demand was forecast at 61,200,000 bbl. daily.

The daily average supply of domestic crude oil estimated to meet the market demand in January is 4,738,700 bbl., an increase of 321,500 bbl., 7.3 per cent, compared with the same month in 1944.

Data for the first 10 months of 1944 combined with such current figures as are available for November and December indicate that the total demand for motor fuel in 1944 will approximate 738,000,000 bbl., a gain of almost 19 per cent. The indicated yield of gasoline from crude oil is about 39.4 per cent compared with a yield of 37.1 per cent in 1943. The gain in the demand for motor fuel has been the outstanding factor in the demand for refined products in 1944 as the combined total demand for residual and distillate fuel oils will show an estimated increase of only about 9 per cent compared with 1943.

The production of domestic crude petroleum during 1944 is estimated at 1,678,000,000 bbl., an increase of about 11 per cent compared with 1943, and the demand for domestic crude petroleum should approximate 1,700,000,000 bbl. indicating a decline in stocks of domestic crude petroleum of about 22,000,000 bbl. during the year. The daily average demand rose from 4,478,000 bbl. in the first quarter to 4,623,000 in the second quarter, to 4,735,000 in the third quarter, and may amount to about 4,740,000 bbl. daily in the fourth quarter. The forecast for the first quarter of 1945 indicates a demand for domestic crude petroleum of about 4,730,000 bbl. daily, assuming a moderate decline in production and a corresponding reduction in stocks of domestic origin.

SUMMARY OF FORECAST FOR JANUARY 1945
(Barrels)

	Forecast		Actual
	January 1945	December 1944	January 1944
Demand for motor fuel*	61,000,000	61,200,000	53,114,000
Supply of motor fuel:			
Straightrun and cracked gasoline prod.	56,340,000	56,040,000	51,575,000
Natural gasoline used at refineries	6,060,000	6,060,000	5,382,000
Total refinery production	62,400,000	62,100,000	56,957,000
Other natural gasoline and imports	1,900,000	1,900,000	1,683,000
Increase in finished stocks	3,300,000	2,800,000	5,526,000
Available supply	61,000,000	61,200,000	53,114,000
Crude-oil requirements:			
Per cent yield of gasoline from crude	39.10	39.00	38.73
Refinery crude required	144,100,000	143,700,000	133,161,000
Daily average	4,648,400	4,635,500	4,295,500
Domestic crude runs	139,900,000	139,800,000	130,042,000
Exports, fuel and losses	7,000,000	7,200,000	6,892,000
Total demand for domestic crude	146,900,000	147,000,000	136,934,000
Daily average	4,738,700	4,741,000	4,417,200
Decrease in domestic stocks	.....	.....	1,167,000
Actual production	.....	.....	135,767,000
Daily average	.....	.....	4,379,600

*Motor fuel as used in this report includes gasoline and naphtha consumed for all purposes, but does not include heavier distillates for the operation of tractors or burned in diesel engines.

Restrictions Eased on Premium Motor Fuel

WASHINGTON. — United States refiners will be able to increase slightly the quantity of premium motor fuel that can be manufactured for buses, fire engines, ambulances, large trucks and other essential vehicles, Petroleum Administrator for War Harold L. Ickes said last week.

Action was taken by issuing Amendment 3 to Petroleum Distribution Order 21. The amendment became effective on January 1, 1945.

Discussing the terms of the amendment, Administrator Ickes said:

"As a result of this action, refiners will be able to manufacture a slightly larger quantity of premium motor fuel than was permitted during December. However this does not mean that civilian motorists will be able to obtain additional quantities of premium gasoline, as the total increase granted by the amendment is not expected to exceed 60,000 bbl. a day for the entire country. It is intended that most of the increase will be consumed by essential vehicles."

Oil Rationing Dates

Gasoline

A-14 coupons, good for 4 gal. each, remain valid through March 21, 1945.

B-4, C-4 and fourth quarter T coupons expired at midnight, December 31, 1944.

Fuel Oil

Period 2 coupons, good for 10 gal. per unit, continue valid throughout the heating year. In the Midwest and South, period 3 coupons, are now valid. Period 3 coupons become valid in the Far West on January 8, 1945.

Period 1 coupons continue valid throughout the heating year.

THIS WEEK

INTERNATIONAL—Soviet Russia asked to explain removal of Romanian refinery equipment. . . . U. S. and British representatives severely restricted in Romanian movements and communications. . . . Soviets claim all machinery shipped to Russian plants is German and, therefore, constitute spoils of war. . . . American and British representatives, obviously, not entirely satisfied, . . . Visual proof sought that Romanian plants are used to most effectively further Allied war interests. . . . ¶Bolivia acquiring American equipment to expand petroleum operations. . . . Foster Wheeler Corp. studying technical aspects of new refinery construction. . . . Other American technicians engaged to study production and transportation problems. . . .

DRILLING—World's deepest drilling well in California halted at 16,246 ft., 967 ft. below the previous record holder in Pecos County, Texas. . . . No commercial showings reported in lower Miocene section. . . . ¶Completions end year at low level. . . . ¶Industry falls short of PAW completion goal, if service wells are excluded, exceeds it if they are counted. . . . ¶Holiday shutdowns, inclement weather restrict current operations. . . .

SUPPLIES—Allied production of aviation gasoline exceeds operational requirements, for first time since war started. . . . ¶Crisis in residual fuel at Chicago narrowly averted, by emergency transportation steps. . . . Transportation pinches becoming more numerous. . . . ¶Inventories insufficient to absorb heavy shocks in consumption—at the point of consumption. . . .

MATERIALS—General tightening of material controls expected to result from rude awakening in Europe. . . . Tubular goods are likely to be most seriously reduced by intensified bomb, rocket and shell production programs. . . . ¶Industry cannot afford to be lax in claiming materials, leaders assert. . . . Era of producing more oil with inadequate operating supplies fading rapidly. . . . ¶Increasing average depth of completed wells requires record tonnage and footage of tubular steel, from drill pipe to tubing—and rods. . . .

PRICES—Double-barreled attack launched against Office of Price Administration crude-oil ceilings. . . . At least two cost studies in prospect—but one may give way to the other. . . . OPA awaiting acceptance of appointments to industry-wide advisory committee—before sending questionnaires on cost of production. . . . Independent Petroleum Association of America seeking power of attorney to represent individual members in price-ceiling protest. . . . Task of studying cost, documenting evidence and other tedious digging may be flipped to I.P.A.A. . . .

SUBSIDY—Tabulation of August payments indicates previously estimated cost of $55,000,000 annually about on the beam. . . . ¶Newly completed wells on subsidy leases must be certified before Defense Supplies Corp. will make subsidy disbursement. . . . ¶Some operators quietly working for permanent differential between stripper and flush-oil prices—through government subsidy. . . .

DEMAND—January gasoline requirements expected to total 61,000,000 bbl., 15 per cent above last January, slightly under December. . . . Crude requirements forecast at 4,738,700 bbl. daily. . . .

Greatly intensified military operations on the western front and their attendant demands on motor-fuel distribution signaled a search for all idle "Jerricans." Collecting stations were established throughout the military zone similar to this one at Liege, Belgium, appealing for assembly of all A. W. O. L. "Jerricans"

Wide World—Signal Corps Photo

Oil-Pact Differences May Be Ironed Out Before PIWC

WASHINGTON.—Action to revive the Anglo-American petroleum agreement probably will be discussed by State Department officials before the January 17 meeting of the Petroleum Industry War Council.

The study to date has given State Department officials every reason to hope that revisions can be made which will be acceptable to the State Department, the oil industry, the Senate, and the British Government. These officials insist that the scope and intent of the official draft now pending before the Senate and of the PIWC substitute are exactly the same and that it should be a simple matter to arrive at phraseology which will be acceptable to all concerned.

A general rephrasing will be undertaken by State Department attorneys and protocol experts in order to substitute diplomatic niceties for the blunt oil man's language of the PIWC draft, but the officials declare that this will be only for the sake of tradition and appearance and not to twist the meaning or include any jokers.

Aside from phraseology, there are only three important points to be ironed out. The first of these is the exclusion of all Crown colonies, protectorates and dependencies from the definition of the United Kingdom. These areas are scattered all over the globe, and the belief is that the PIWC struck them out in the interest of simplification and without analysis of the effect of this action. The only ones important from a petroleum standpoint are Trinidad, Sarawak and North Borneo. The State Department feels that the British will insist that their takings of Trinidad oil be considered a domestic rather than an international movement, just as the United States considers Alaskan oil as a domestic development. The United States oil industry will be asked to yield on this point of the PIWC draft.

Probably the most troublesome point is the PIWC stipulation that actions taken in compliance with recommendations of the International Petroleum Commission shall not be considered violations of the antitrust laws. The State Department is in full sympathy with this point but feels that it is a domestic question and has no place in an international treaty. Department lawyers intend to confer with the Department of Justice in an attempt to work out some other method of giving the industry assurance on this point so that the proposed language can be dropped from the agreement before it is reinitiated with the British Government.

The final troublesome point is the reservation that either country may limit imports of petroleum. Since there was nothing in the original draft to suggest that imports could not be limited, the sovereign right of either nation to control imports was not affected and this clause is considered unnecessary. For this reason it may make little difference whether it is retained or dropped, but the department wants to get the industry's view clarified on this point before reopening negotiations.

Charles B. Rayner, petroleum adviser to the secretary of state, probably will discuss these subjects informally with the PIWC at its January 17 meeting, and may also confer with individual oil industry executives. The proposed revision will then be discussed with members of the Senate committee on foreign relations in an effort to secure the support of this body in advance of any further formal action.

The British Government will not be asked to reopen the subject until the State Department has virtual assurance that the proposed revision will meet no objection from the American oil industry and is likely to be ratified by the Senate. When that is achieved the pending draft will either be withdrawn from the Senate or negotiations will be reopened with the British and a substitute sent to the Senate later. The procedure to be used will depend on State Department attorneys.

New Wells on Subsidy Leases Must Be Certified

WASHINGTON.—New wells brought in on leases already included in the stripper-well subsidy, and old wells drilled to new horizons must be certified to the Office of Price Administration before subsidy claims can be paid, the petroleum branch said this week.

The certifications are necessary to show that production comes from sands approved for subsidy payments during 1944, and are designed to prevent inclusion of new wells drilled into new horizons. The latter are not eligible for subsidy payments.

Forms for certification, by producers and state regulatory agencies, will be mailed by Defense Supplies Corp. to purchasers within a few days. Purchasers are asked to pass the forms on to producers, who must return two copies of the form for each new deepened well to OPA's petroleum branch.

The forms call for the following information from producers: Location of well, depth, date of completion, sand from which oil is produced, total number of new wells on a given lease completed since January 1, 1944, and the production of each well in question from date of completion to date of filing.

In addition, the state oil regulatory agency must certify for each new or deepened well that it is producing from a horizon or sand which was in production prior to January 1, 1944, in the same pool, and is thus eligible for premium price payments. In the event this agency is unable to certify the horizon, the district industry advisory committee may do so.

Index Ready Soon

The complete editorial index of The Oil and Gas Journal for 1944 will be ready soon, but, conforming to practice in previous war years, it will not be published in a regular issue. The 1944 index, bound separately, will be sent without charge to all subscribers requesting a copy. Address requests to Circulation Department, P. O. Box 1260, Tulsa.

Tanker Cited for Aid in Marshall Islands Battle

WASHINGTON.—"Excellent service and outstanding cooperation," which the merchant officers and crew of the American tanker La Placentia gave the Navy in the conquest of the Marshall Islands, won for them an official citation by Adm. Chester W. Nimitz, commander of the U. S. Pacific Fleet and Pacific Ocean Areas.

The cited tanker, 12,304 deadweight tons, was built at San Pedro, Calif., in 1921 and is owned by the Union Oil Co. of California. Time chartered to the War Shipping Administration, she is operated in war service by the oil company. The master of the vessel is Capt. Maurice V. Ring, 625 South Washington Street, Dillon, Mont.

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

Still Greater Demands

THE petroleum industry starts a new year on an all-out war basis. The production programs inaugurated 3 years ago and since then added to and revised from time to time, are now largely completed. Present facilities are turning out 100-octane gasoline, butadiene, toluene and other war products in excess of rated capacities.

It now appears certain that operators will be called upon for still greater contributions to support of the United Nations war program. A few months ago most planning was based on the assumption that the new year would witness the end of the European war. It was agreed then that so long as the Pacific conflict continued there would be little or no reduction in total volume required, but additional demands were not in prospect.

Had V-E day materialized by January 1 there would have been shifts of consumption which would have made more products available to civilians, a necessary part in any reconversion program. Operators, while maintaining full war schedules, could have made plans for postwar activities.

While the offensive strength shown by the enemy on the western front may prove to be temporary, and hasten rather than delay his final collapse, the realistic viewpoint now is to assume that victory in that area has been delayed for many months, which petroleumwise means expanded support for a war to continue on all fronts through the greater part or all of 1945.

From a demand standpoint this will necessitate a still greater output of war products in this and other countries. In aviation fuels, military developments are increasing the "super" grade requirements of particular importance in the long-range bombing of the Pacific theater. Petroleum refiners are now the largest supplier of butadiene, the principal component of synthetic rubber, a critical material in which there is a shortage at this time.

The difficulties ahead can best be visioned by those who have the responsibility of production and transportation. Sources outside this country are in a better position than they have been at any previous time to enlarge their output, but there will be no easing in the ever present transportation problem.

Washington officials have stated that more steel and other critical materials are to be needed in the manufacture of military equipment, with less available for other uses. It has been explained that this development may be reflected in the quantities of materials available to the oil industry.

The matter of materials goes to the core of the petroleum industry's future war contributions. To conserve materials drilling has been curtailed to approximately 50 per cent of what it would have been in peacetime to supply the greatly expanded crude-oil production. All normal maintenance and repair, which in the final analyses are the backbone of what can be done in war production, have been below minimum requirements for 3 years.

That operators will find some way to assure full support of an enlarged war program no one will doubt who is familiar with what has been done under most trying conditions. But the war agencies will have to realize that there is a limit to what can be accomplished without adequate materials and manpower. The petroleum industry's Washington representation has an immediate responsibility in this matter.

Progress of the LIQUEFIED PETROLEUM GAS Industry in 1944

by G. G. Oberfell and R. W. Thomas

G. G. OBERFELL

R. W. THOMAS

This annual review of the situation with regard to liquefied petroleum gas operations is acknowledged to be the most comprehensive available on this phase of the industry. G. G. Oberfell is vice president in charge of research, Phillips Petroleum Co., and R. W. Thomas is manager of the chemical products department of Phillips. The Phillips company occupies a dominant position in LPG manufacturing operations, which fact places the authors in position to speak authoritatively.

MARKETED production of liquefied petroleum gases for other uses than synthetic rubber and aviation gasoline is estimated to have increased 110,000,000 gal. or 16.2 per cent in 1944 to 785,000,000 gal. The estimated increase for LPG purposes was 20,000,000 gal. larger in volume than the increase shown the previous year.

Household (domestic) demand for LPG is estimated to have increased 53,000,000 gal. or 15.5 per cent in 1944 to 392,000,000 gal. In 1943 the increase in household (domestic) consumption was 39,821,000 gal. or 13.3 per cent and in 1942 it was 78,837,000 gal. or 35.7 per cent. Wartime restrictions kept new installations at a low level but there was a considerable amount of shifting of equipment from summer cottages and similar seasonal dwellings to the homes of year-around users. Demand for LPG also was greater from existing consumers because of economic conditions.

It is estimated that there were 1,950,000 domestic users of LPG on December 31, 1944, an increase of 50,000 during the year. Buried butane installations in the South increased an estimated 16,000 in 1944 to 335,000 and all other types of domestic installations are estimated to have increased 34,000 to 1,615,000.

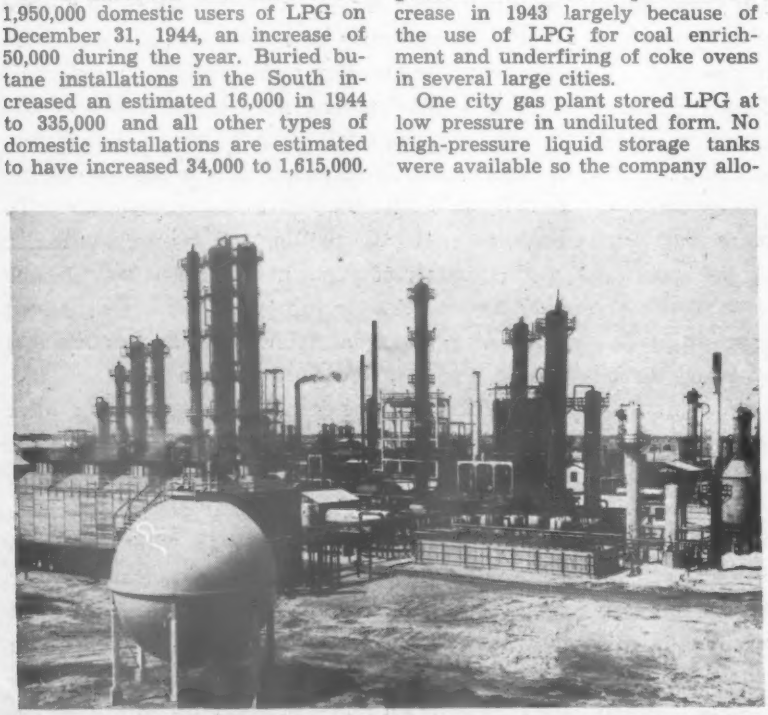
Industrial fuel, internal-combustion-engine fuel and miscellaneous uses of LPG rose an estimated 44,000,000 gal. or 18.1 per cent in 1944 compared with an expansion in demand of 41,501,000 gal. or 20.6 per cent in 1943. Most of the increase in industrial-fuel use may be attributed to the fact that war-plant consumers of LPG were operating during the entire year of 1944, whereas many of these plants did not begin operating until the middle or latter part of 1943. The relatively minor war-contract cancellations and cutbacks near the close of the year did not materially affect the industry, moreover these contract reductions and cancellations came at a time when the normal seasonal-use curve was rising.

Increase Greater Than 1943

City gas plants are estimated to have consumed 46,000,000 gal. of LPG in 1944, an increase of 22.6 per cent over 1943. This increase was greater than the 19.6 per cent increase in 1943 largely because of the use of LPG for coal enrichment and underfiring of coke ovens in several large cities.

One city gas plant stored LPG at low pressure in undiluted form. No high-pressure liquid storage tanks were available so the company allocated a 3,000,000-cu. ft. gas holder to butane and propane storage. As tank cars were received the butane or propane was vaporized in a conventional heat exchanger and undiluted vapor pumped into the holder at 6-in. water-column pressure. The gas holder acted as a standby from which gas was withdrawn at peak-load periods, diluted and added to the send-out stream. By storing 3,200 B.t.u. butane vapor instead of 530 B.t.u. gas the capacity of the holder was expanded in effect from 3,000,000 to 18,000,000 cu. ft. of 530 B.t.u. gas. At present the holder is being used for the storage of undiluted propane vapor. This is because butane is unavailable now in adequate quantities because of war demands for aviation gasoline and synthetic-rubber components.

Utilization of LPG for chemical manufacturing is estimated to have increased about 5,000,000 gal. in 1944 to 60,000,000 gal. Chemical sales represented 7.7 per cent of total LPG utilization compared with 8.2 per cent in 1943 and 9 per cent in 1942. These figures do not, of course, include normal butane or butenes used



Butane isomerization and hydrogen fluoride alkylation plant for production of aviation gasoline and synthetic-rubber components in a modern refinery

Liquefied petrolum gas installation for a city of over 2,000 population

in the production of butadiene for synthetic rubber. No estimate is included to cover natural isobutane or normal butane isomerized by catalytic processes to isobutane or C_3 and C_4 unsaturates produced by cracking and alkylated with isobutane for the production of 100-octane aviation fuel.

For several years the trend in the LPG industry has been in the direction of a more rapid increase in propane than in butane consumption. Wartime demands for butane accelerated this trend in 1944. In 1942 marketed production of butane and butane-propane mixtures in which butane predominates, increased 98,981,000 gal. while propane sales increased 23,542,000 gal. Propane represented 19 per cent of this total increase. In 1943 the war almost reversed the situation so that butane and butane-propane mixture sales increased only 22,328,000 gal. and propane sales 67,762,000 gal. Propane represented 75 per cent of this total increase. In the year just closed it is estimated that there has been no substantial increase in the sale of butane and mixtures and it may be predicted that in 1945 the sale of butane and mixtures will be reduced materially. This will be due primarily to conversion of large-scale industrial and utility consumers of butane to propane.

Petroleum Administration for War announced at midyear that aviation-gasoline production had reached 16,800,000 gal. daily and in the fourth quarter the completion of other 100-octane plants increased this total to more than 21,000,000 gal. daily.

With the synthetic-rubber construction program completed and producing at the rate of 350,000 tons per year of buna and butyl rubber from petroleum hydrocarbons this war industry is requiring an estimated 765,000 gal. daily of C_4 hydrocarbons.

The large number of gallons per day of C_4 hydrocarbons now used by rubber and aviation gasoline suggests that there will be a tremendous oversupply of butanes for LPG once the Pacific war is over. It should be remembered, however, that the oil-refining industry has been robbing motor fuel of volatility in order to feed the modern war machines in the same way that the LPG industry has limited its sales to make butane available to fight the enemies of our country. When the war is over gasoline quality for civilians will be improved. Also it is probable that war-developed techniques of C_4 utilization in aviation gasoline undoubtedly will be adapted to peacetime gasoline production. Aviation-gasoline demand will not be significant when compared with war demand but at least some alkylation plants will consume very large quantities of butanes in the production of automobile gasoline of higher quality.

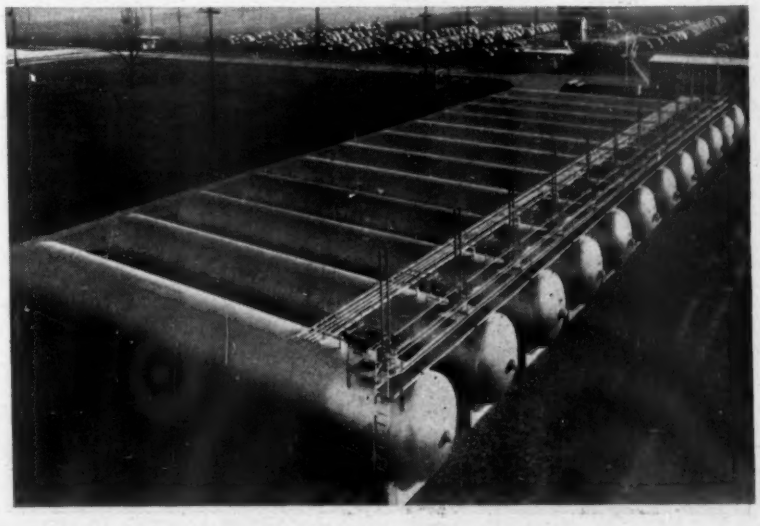
There has been a great deal of discussion in the industry about chemical utilization of LPG hydrocarbons. This outlet for LPG will, of course, be more important after the war than it is today, but the volumes which will be used in chemical synthesis at competitive prices are not great enough to be a threat to the supply of C_4 and C_3 hydrocarbons for domestic and industrial use.

During the past year one chemical manufacturer has been building a large plant in the lower Gulf Coast region which will take propane and butane by pipe line from a group of gasoline and recycle plants in the vicinity. Before the plant was completed it was announced that it will be doubled in size. This plant will consume about 80,000 gal. per day of LPG. It will be one of the largest hydrocarbon chemical plants in the country.

Another company which has had a war plant on the Gulf Coast at which propane and ethane are used as raw materials is to enlarge its plant when the war is over. This plant will utilize 80,000 gal. per day of ethane-propane mixture by pipe line from a recycle unit as well as overhead from a depropanizer tower in another plant.

Products of Cracking

Propane and normal butane are relatively nonreactive chemically but research has shown that they may be processed to produce substances of high chemical reactivity. LPG, for example, may be cracked to yield ethylene, acetylene, propylene and other substances. To these unsaturates all manner of chemical reagents may be added to produce myriads of useful new compounds. For example, ethyl alcohol is produced by chemical synthesis of water and ethylene. Other products from ethylene include ethylene glycol which is widely used as an antifreeze as well as a source for the production of important chemi-



Battery of industrial propane tanks, capacity 288,000 gal., at Kohler Co.

cal raw materials, solvents and plastics. The possibility for production of both old and new organic chemicals from light-hydrocarbon raw materials are indeed most intriguing and almost without limit as to number.

While the variety of chemicals is great the possible volume is very small when compared with the total supply of petroleum hydrocarbons available for use as raw materials. In 1944 the total volume of all organic chemicals produced in the United States was only 78,000 bbl. per day, while the production of crude petroleum was 4,500,000 bbl. per day. The value of organic chemicals is high when compared with LPG, gasoline or crude oil, but the cost of production is correspondingly high because of the large plant investment and the small volumes produced.

During 1944 the outstanding development in the industrial consumption of LPG was the large-scale conversion of industrial users from the use of butane to propane. At the outset of the war the major producers of butane began working with their large industrial consumers urging conversion to propane so that the aviation-gasoline and synthetic-rubber industries would have adequate supplies of butane. Except for those big industrial concerns which had the foresight to install propane tanks even though butane was used, conversion to propane could not then be accomplished because of lack of suitable storage. Where 200-lb. working-pressure storage was available conversions were made in 1943. Where 80 to 100-lb. working-pressure tanks were in place it was necessary to go to the War Production Board for steel allocations in order to make the changeover. Early in the war period steel was more critical than butane because neither the 100-octane plants nor the synthetic-rubber plants were on stream. In the latter half of 1944, however, the steel situation eased and new 200-lb. working-pressure tanks could be obtained for essential purposes.

One large industrial plant in the Middle West which consumed 20,000 gal. of butane per day up to late October now is entirely converted to propane. In the Chicago area alone one LPG manufacturer was able to reduce its sales of butane about 35,000 gal. per day in recent months by converting its customers to propane. The butane released is being isomerized and used in the production of aviation gasoline or used as raw material for synthetic-rubber components.

Wildcat Operations Increase

Wildcat drilling operations throughout the region where the occurrence of oil is anticipated increased rapidly in 1944 as the war threw a tremendous burden on present oil-producing fields. These operations in regions remote from natural gas created a large demand for butane-propane mixtures to fuel these drilling rigs. In order to conserve butane-propane mixtures for domestic uses PAW recently ruled that LPG may not be used during the winter months in fields where natural gas is available.

The high level of agricultural operations in the irrigated fields of the Southwest created an unusually large demand for LPG in the latter part of the summer, when LPG engines driving irrigation pumps were in use. Dehydrating units for alfalfa and similar products, cotton ginning and other farm uses required great quantities of LPG.

There was an acute shortage of product and transportation in January and February 1944, created by war demands for butanes and for pressure cars to carry the light hydrocarbons between manufacturing plants. As a result of this shortage PAW appointed a committee from the industry to survey availability of C_3 and C_4 hydrocarbons and to compare these figures with estimated requirements for aviation gasoline, synthetic rubber, and LPG uses. This industry committee has spent an immense amount of time on the problem and has made a number of worth-while recommendations to PAW.

At the southern section meeting of the Liquefied Petroleum Gas Association at New Orleans in September, Paul K. Thompson, chief of the LPG section of PAW, presented a paper based on findings of the survey committee which he titled: "Will We Weather the Winter?" Thompson presented a nine-point program to the industry which included early filling of all customer and bulk-plant storage and classification of customers in order of preference for deliveries during critical periods. Early fall sales curves suggest that many domestic distributors have accepted this advice. The severity of the winter crisis in early 1945 now must depend largely on the severity of the winter.

The conclusion of the German war is expected to cause a substantial immediate curtailment of industrial fuel sales to war plants. The magnitude and duration of this curtailment depends on how many and how soon such plants convert to peacetime operation.

There has been increasing interest by manufacturers of internal-combustion engines in the development of an LPG fueled engine.

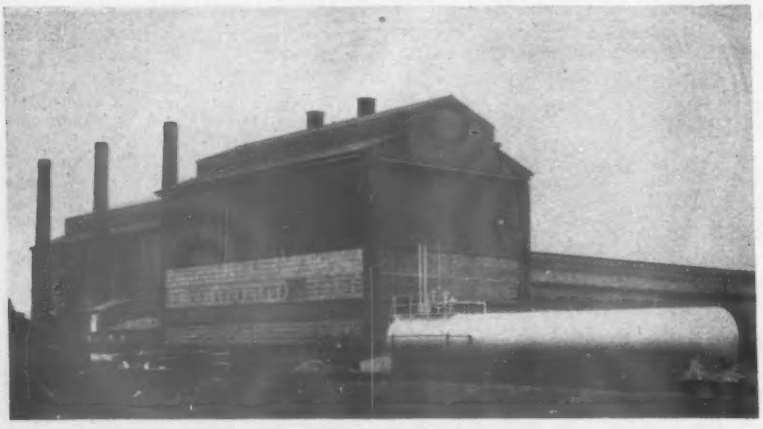
Considerable additional study is being made of LPG fueled units for air conditioning railroad equipment. It is anticipated that propane-fired engines, fans and refrigeration units will be developed further for perishable-goods cars so that uniform temperatures may be maintained in transit.

Many distributors have been planning for postwar expansion. There is a clearly defined trend to install 200-lb. working-pressure storage so they will be prepared to distribute propane, butane or mixtures as market conditions may dictate. In 1944 WPB has approved the installation of a considerable number of additional propane storage tanks at previously existing bulk stations. Some of these were delivered and installed in time to alleviate the 1944-45 winter crisis.

Looking to the postwar domestic market the distributor sees that only a little over 10 per cent of the homes in the United States without gas service have installed LPG. There are about 15,000,000 homes not connected to gas mains and about 2,000,000 homes served by the LPG industry. For several years after the war it is expected that domestic customers will increase at the rate of at least 500,000 per year.

Indications are that the distribu-

(Continued on page 105)



Industrial propane installation at a large foundry

Passenger-Car Tire Shortage to Persist Long After War Ends

NEW YORK.—The lack of passenger-car tires very likely will be the real bottleneck in passenger-car transportation after the war, according to B. I. Graves, vice president of Tide Water Associated Oil Co., and chairman of the product conservation committee of the Petroleum Industry War Council.

Graves released a letter from J. F. Clark, director, Rubber Bureau, addressed to PIWC in which he cautioned the industry that:

"There will be many passenger cars, trucks, and buses immobilized due to lack of tires if we fail to continue the conservation measures which have succeeded in bringing us to this stage of the war. We cannot relax our efforts at this time. It will be many months before supplies of new tires will be available for all types of civilian use. We rely upon you to stimulate a new interest in tire conservation."

Graves, quoting from a survey by one of the large tire companies, said that the demand for passenger-car tires would total 70,000,000 casings in the first year after the war. That is more than the output of the entire industry in any peacetime year and will far exceed peak production capacity. Only one analogy can be reached from these facts he said, and that is there will be a lot of people who need tires for their cars that will be unable to get them for some time after the war ends.

This tire shortage imposes on the petroleum industry another serious problem, said Graves whose committee handled the gasoline conservation program, and the industry's campaign to eliminate the black market in gasoline-ration coupons. Like that problem, we are going to do what we can to help the situation. The results we achieved in our fight against the black market in gasoline clearly indicates what the petroleum industry can do when every member of this great organization sets a task for himself and all work together. The men in the service stations have been largely responsible for stamping out the evil traffic in stolen and counterfeit gasoline coupons, and we believe that when they are given the present facts regarding the passenger-car tire situation they will do an equally good and satisfactory job.

Every service station operator has a stake in the tires that are on the cars today. They represent to him a customer. As a station operator, it is his duty to see that those tires receive the care that will keep them running and keep the cars in service. Dead ducks, in the form of immobilized cars from whatever the cause may be, represent lost customers to the industry.

The best estimates obtainable are that 1,500,000 cars per year are going off the roads and out of service for mechanical and other reasons. We can, by an intelligent approach to the tire problem, keep a lot of those cars in service.

Synthetic tires will give good service if they are given proper care. They must be kept properly inflated at all times. To keep them inflated, they require regular attention and the customer must be made to realize this important factor in the care of his synthetic tires.

There are millions of old tires still in service that can be made to give months and months of service if they are recapped and cared for as the present serious tire situation indicates that they should be cared for. Station operators should advise their customers that the tire situation is serious and may become critical and encourage them to have their old tires recapped before it is too late and also keep their tires properly inflated at all times, which requires constant checking and care.

Subsidy Payments to Total $55,000,000 Annually

WASHINGTON.—Payments in the stripper-well subsidy program will come close to the original estimate of $55,000,000 a year, the first monthly tabulation of payments indicates. During August, $4,576,650 was paid thus far to 206 purchaser claimants for 12,023,056 bbl. of crude oil. The figures, considered incomplete, were compiled by Defense Supplies Corp.

Of this, roughly $1,490,095 was paid for 1,986,923 bbl. of Pennsylvania Grade crude at the subsidy rate of 75 cents a barrel.

Payments of 35 cents a barrel for less-than-5-bbl.-daily production amounted to $2,379,944 for 6,800,038 bbl. In the 5 to 7-bbl.-daily class, carrying a 25-cent subsidy, $290,787 was paid for 1,163,459 bbl., and in the 7 to 9-bbl.-a-day group, with a 20-cent subsidy, payments amounted to $413,539, for 2,067,665 bbl.

Special cases of miscellaneous nature made up the difference of 9,971 bbl. for which $2,287 was paid.

The payments reported cover more than 400 pools. At the August rate, the year's payments would run a little under the original $55,000,000 estimate, but additions to the list of qualified pools are expected to make up the difference.

Contracts Approved for Sale of Elk Hills Crude

WASHINGTON.—Sale of approximately 8,000,000 bbl. of Elk Hills crude oil to six refiners was approved this week by the president.

The oil is the estimated total production for the account of the Navy from Naval Petroleum Reserve 1 for the 6 months ending June 30, 1945. Purchasers were the Union Oil Co. of California, Shell Oil Co., Inc., General Petroleum Corp. of California, The Texas Co., Richfield Oil Corp. and Mohawk Petroleum Co.

This is the second sale of Elk Hills crude oil to be produced under the unit plan contract signed last June 19 between Navy and the Standard Oil Co. of California. It is expected that a third offering of crude oil from the field will be made early this spring.

This will be the final offering under the emergency program of increased production authorized by joint resolution last June. The third offering will be for production during 5 months ending November 30.

Diesel Not a Competitor Of Gasoline Engine

NEW YORK.—There is no prospect that high-speed diesel engines will be used in pleasure automobiles and light airplanes, T. B. Rendel, of Shell Oil Co., Inc., told the Metropolitan section of Society of Automotive Engineers here December 15, in his discussion of "Postwar Internal-Combustion Engines and Their Fuels."

"While we may expect an effort to increase the speed, and therefore the power output of the light diesel engine," Rendel said, "it is hardly probable that the overall economy, taking into account the increased weight, will enable it to compete with the gasoline engine."

Rendel, who is assistant to Shell's vice president in charge of manufacturing, summarized the different types of internal-combustion engines now in use, the fuels they consume, and how the fuels are manufactured.

"It is not probable," the speaker said, "that in the near future internal-combustion engines will be able to consume solid fuels in powdered form, and the manufacture of liquid fuels from coal is at present too expensive. Alcohol made from farm products is not at present attractive as a fuel, since it cannot be used at anything like the cost of petroleum fuels."

Penn Grade Group Blasts Pearson

OIL CITY.—Billions of barrels of top-quality crude oil remain in fields of the Pennsylvania Grade region and it would be folly to import Russian oil and try to store it underground there, the Pennsylvania Grade Crude Oil Association last week told Columnist Drew Pearson.

The news commentator drew a reply from the association, spokesman for most of the producers and refiners of Pennsylvania oils, to an article in the current issue of a popular magazine. Predicting things to come in 1945, Pearson said:

"We shall actually import oil from Russia and store it in the depleted, nonporous oil wells of Pennsylvania."

Far from being depleted, the association declared, Pennsylvania Grade crude oil sands contain 6,364,021,000 bbl. of the premium petroleum, according to U.S. Bureau of Mines estimates. Recoverable by present methods are 927,856,000 bbl., the bureau says, equivalent to a 34-year supply at current rates of production for this area. New ways to harvest the "bumper" crop of oil still underground are being sought through research.

Terming "entirely unrealistic" the economic factors involved in any project to bring in Russian oil and force it under pressure into the Pennsylvania sands, only later to recapture the same crude by expensive secondary recovery, the association said the estimated cost of the Russian-Pennsylvania admixture would exceed greatly the present price of Pennsylvania Grade crude at the well.

But most serious to the nation, the Pennsylvania oil industry's spokesman said, would be the inevitable contamination of the Pennsylvania Grade crude—highest priced in the United States because of its high lubricating content—by Russian oil, precluding the recovery intact of the premium Pennsylvania oil and leading to unavoidable loss of petroleum deposits.

Crude Subsidies Paid After January 1 Held Legal

WASHINGTON.—Subsidy payments for crude oil made after January 1 are legal, according to an opinion given by John D. Goodloe, general counsel for Defense Supplies Corp. The opinion was issued in connection with a view expressed in some areas that such payments would be without legal basis.

Section 213 of Public Law 358 provides: "After January 1, 1945, no part of any appropriation or fund made available by this or any other act shall be allotted or made available to, or used to pay the expenses of, any agency or instrumentality, including those established by executive order after such agency or instrumentality has been in existence for more than one year, if the Congress has not appropriated any money specifically for such agency or instrumentality or specifically authorized the expenditure of funds by it."

Ceiling Price of Old Ocean Crude Is Raised by OPA

WASHINGTON.—An increase of 12 cents a barrel in ceiling prices of crude oil produced in the Old Ocean field of Brazoria and Matagorda counties, Texas, was announced last week by Office of Price Administration. The increase was allowed in order to bring the ceiling in that field up to the level of postings for other Gulf Coast crude of similar grade.

Standard Oil Co. (Ky.) In New Offices

LOUISVILLE.—Standard Oil Co. (Kentucky) has moved its principal offices to the Starks Building, Fourth and Walnut streets. The Kentucky district offices remain at 430 West Bloom Avenue.

DEATHS

Nelson K. Moody, 67 president of Sinclair Prairie Oil Marketing Co. and Sinclair Crude Oil Purchasing Co., died December 30 at his home in Tulsa following a year's illness. Born in Titusville, Pa., Moody graduated from Lawrenceville (N. Y.) Academy and then, in 1899, from Cornell University, following which he entered the service of The Carter Oil Co. shortly after its organization in Sistersville, W. Va. In 1906 he was sent to Romania, where for 3 years he was in charge of Standard Oil Co. operations. Upon his return to the United States he was made a vice president of Prairie Oil & Gas Co. and later its president. When Prairie was absorbed by Sinclair Oil Co. in 1932 Moody was chosen president of the combined crude-oil and marketing subsidiaries and moved to Tulsa from Independence, Kans.

Clarence H. Lieb, 50, president of Creole Petroleum Corp., New York, died December 30 in West Palm Beach, Fla., where he had gone in search of health. Lieb was born in Roaring Branch, Pa., and graduated from Pennsylvania State College in 1916. He joined Carter as an engineer in the Sistersville, W. Va., field. He was transferred to Mexico in 1918 and soon was made superintendent in charge of all pipe-line and pump-station construction for Cia. Transcontinental de Petroleo, S. A., a Standard Oil Co. subsidiary. Promotions followed, and in 1926 he was made president and general manager of the company. In 1928, Lieb was made vice president of Creole Petroleum Corp. and president of Standard Oil Co. of Venezuela, leaving his Mexican post. In 1932 he resigned all other oil connections to assume the presidency of Carter. In 1938 he was placed in charge of foreign production of Standard Oil subsidiaries. He became president of Creole in 1941.

Harry E. Randall, 56, of Shreveport, vice president of Compania Mexicana de Gas, S. A., and manager of the industrial sales department of United Gas Pipe Line Co. in Shreveport, died December 28 in a Houston hospital, following a heart attack suffered while visiting in that city. He had been in the service of United Gas and predecessor companies 20 years.

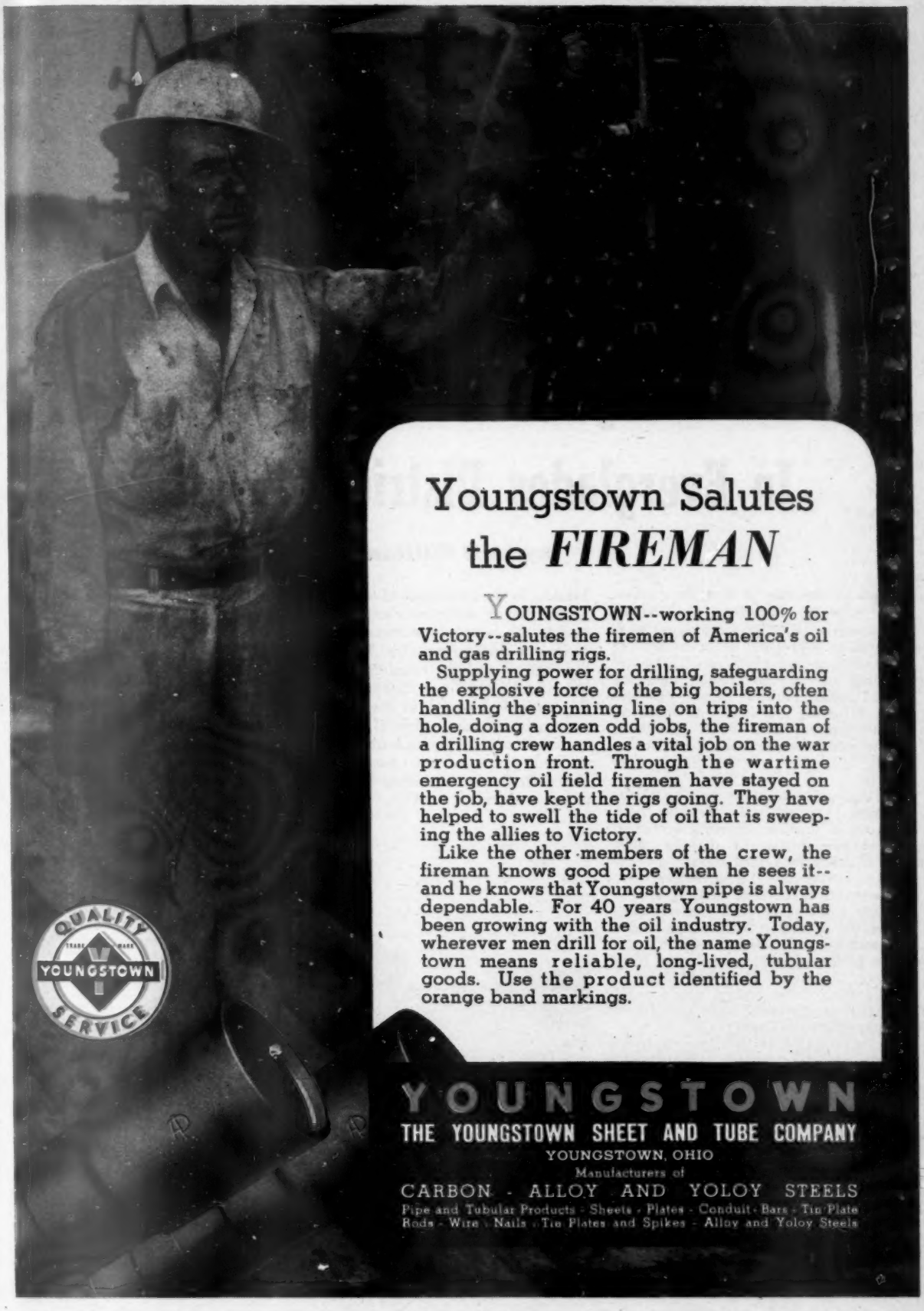
Ray L. Erb, 62, New York, independent oil operator, died December 27 in Yankeetown, Fla. Born in Bradford, Pa., Erb was associated for years with his uncle, the late Elmer E. Smathers, in oil operations. After his uncle's death Erb took over management of the estate, which included oil properties in Pennsylvania and real estate in California.

George S. Whyte, 77, founder of Macwhyte Co., died recently in Kenosha, Wis. He was chairman of the board at the time of his death. Born in Crossgates, Scotland, Whyte came to the United States in 1884.

Leonard M. Harper, 47, maritime superintendent for Maritime Oil Transport Co. since 1932, died December 26 in Houston. Born in Kansas City, Kans., Harper worked for the old Pierce Petroleum Corp., Sinclair Oil & Refining Corp. and Deepwater Oil Refineries, Inc., before he joined Maritime.

Lynn S. Clark, 50, independent oil producer of Dallas, died December 27.

Samuel G. Cox, 39, pipe-line contractor of Weslaco, Tex., died from injuries received in a railroad-crossing accident at La Feria, Tex., recently.



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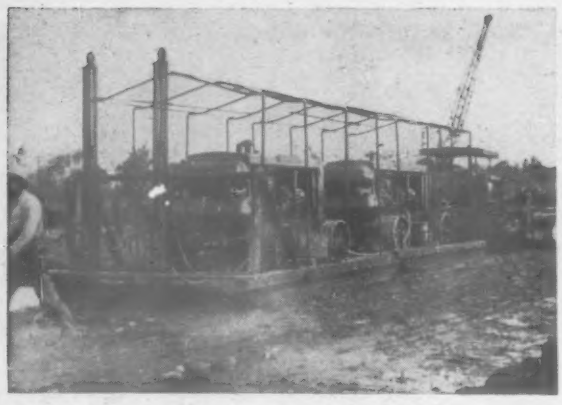
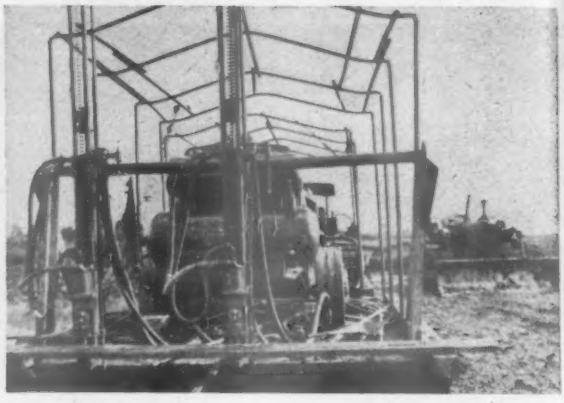




Left: Skid carrying two compressed-air drill units used in drilling shot holes for blasting ditch to Florida location. Right: Rear view of shot-hole drill skid showing drill setup. At right is bulldozer removing mulch mantle from top of coral rock

New Drilling Problems Face Operators In Everglades District of Florida

by Neil Williams

Florida is the most recent addition to the list of oil-producing states and is the scene of increasing exploratory drilling activity. Some of the varied unique conditions being encountered are discussed in this article. A factor in these conditions is a thick section of honeycombed coral bed which underlies a large part of the peninsula. Novel methods are being devised to meet them.

AS in the case of most new areas, wildcat explorations and development in Florida are presenting a number of entirely different drilling conditions and problems. These are being met by the usual ingenuity and resourcefulness of oil operators in adjusting themselves to changing environment and devising means and adapting practices to overcome all obstacles and handicaps that arise.

Unusual conditions and problems being encountered include both those of terrain, affecting access to and preparation of drilling sites, and subsurface formations, governing actual drilling practices. Remoteness of present drilling in the state from other oil areas and centers of operation has been a major handicap in that supplies and service facilities have had to come from long distances. This has incurred operating delays when needs could not be anticipated and has added appreciably to costs.

Particularly distinctive of this state and the basis for various problems is the coral limestone bed which underlies a large part of the Florida peninsula. This formation, several thousand feet thick in places so far drilled, is honeycombed and cavernous and capable of taking anything pumped into it. The paramount hazard in this lies in having to drill without returns (The Oil and Gas Journal, January 6, 1944, p. 56).

Depth at which the coral bed is found varies from the surface in some parts of the peninsula to around 1,500 to 2,000 ft. in others. Where not at the surface it generally is overlain with loose and porous water sands and gravels which also give trouble from loss of returns in drilling surface hole. Where it lies at the surface it also contributes to certain peculiar conditions which have been faced in providing access to and preparing drilling sites.

Spoil of shattered coral rock thrown up by dragline from blasted ditch to form road fill

Such conditions were faced by Humble Oil & Refining Co. in undertaking development in Dade County. Location of the first test, now drilling, is a little over 7 miles off the Tamiami Trail, about 36 miles west of Miami with the nearest town being Coral Gables. Although in the Everglades district, the block is not a dense swamp as generally associated with the Everglades, but rather an open, flat prairie, broken only by scattered hummock groves.

Building of Road

The complication so far as access to the location was concerned is that with the coral bed, a very hard formation, at the surface, drainage water is incapable of cutting ditches and runs off in sheets. Heavy rains sometimes amounting to as much as 10 to 12 in., are frequent and the sheet water often rises to a depth of 18 to 20 in. Also, in view of the flat surface near sea level, drainage is slow and water remains for relatively long periods.

Another difficulty is that although the coral is hard and provides a solid bottom, its top consists of sharp, jagged edges which prevent the use of regular pneumatic-tired

vehicles even when no water covers the surface. Advance engineering parties found it treacherous to traverse the area even on foot. The coral rock is covered only by a thin mantle of mulch, consisting of decayed grass and other vegetable-matter debris, usually not more than 6 to 12 in. thick, which also adds to the difficulties in using vehicles. The early engineering parties made use of a special "glade-type" marsh buggy as the only vehicle capable of getting around. This consisted of an old automobile equipped with extra large wheels and oversize, heavy-duty tires, with two wheels in front and four in the rear.

Preliminary to drilling, it was necessary to build a road the entire 7 miles from the Tamiami Trail to the location. To place it above the anticipated sheet-water high level, the road fill was thrown up to an average height of 2 ft. Material for the fill was obtained by blasting a ditch through the coral the length of the road. As the ditch was blasted, the shattered rock was excavated with a dragline and dumped alongside. This spoil then was spread to the desired width with a power grader and rolled and pressed with a steam roller to form a hard and solid rock.

A ditch 8 ft. wide and 5 ft. deep was blasted. Prior to the blasting the mulch mantle over the rock was pushed off with a bulldozer. Shot holes were drilled about 3 ft. apart and about 8 ft. deep, the spacing and depth varying at places. Scattered test holes previously had been drilled to determine the hardness and consistency of the rock at different places to govern the depth and spacing of the shot holes and the amount of explosives needed.

Shot holes were drilled with compressed-air-operated drills. The drills and air compressors were placed on a skid which was pulled forward by a tractor as successive holes were drilled. The skid carried two compressor units and drills, and holes were drilled in pairs with the two drills being set up at the rear of the skid. Compressors were of a portable type, mounted on trailers which were rolled on the skid, one behind the others, and secured in place.

"Glade-type" marsh buggy used by engineering parties in Everglades work

Rig Foundation

The rock usually was very hard to a depth of about 3 ft. Below this it was honeycombed, containing many cavities. At one place a cavern of undetermined size was exposed under the roadbed by the blasted ditch. The hard surface rock over the roof of the cavern formed a bridge which proved sufficiently strong to stand up under the weight of a 100,000-lb. dragline.

The drilling site was prepared in the same manner as the road bed with the ditch blasted around the sides of the site, approximately 200 ft. square. With the residue shattered rock thrown up, spread, and rolled, an unusually solid foundation was provided for drilling rig.

Although the conditions and methods employed were novel, the actual difficulties and costs involved were somewhat less than those sometimes incurred in getting into and providing locations for swamp or marsh jobs such as exist in many other parts of the Gulf Coast.

In drilling the first test in Dade County, a substantial part of the extremely cavernous section of the coral bed that has been encountered in wells drilled on Humble's Sunniland block in Collier County, about 75 miles west, was missing. Consequently, drilling without returns was not so much a factor as in those wells, although it did have to contend with some loss of circulation. However, it experienced an unusual amount of trouble with twistoffs and fishing jobs.

This trouble occurred mainly while reaming a section of coral limestone from 3,500 to 3,900 ft. A 12¼-in. hole was drilled through this section and very little trouble

(Continued on page 78)

Section of ditch blasted through Florida coral rock with power spreader spreading spoil at side to form roadbed

Internal Corrosion of Tubing in Gas-Condensate Wells Measured by Recording Calipers

by E. H. Short, Jr.

This article describes an instrument which can be run inside the tubing strings under closed-in pressure to determine the magnitude of corrosion pits. The tool has been successfully used to survey 12 Cotton Valley Operators Committee wells, and while the caliper is still in the development stage, it has possibilities for rendering a valuable service.

THE problem of corrosion has been under engineering fire ever since wooden tubing, line pipe, sucker rods, and casing were replaced by iron and steel. However, when operators of the comparatively new gas-condensate branch of the oil industry compared notes and found that corrosion was making a serious attack in well-head connections and tubing serving high-pressure gas-condensate wells, one of the most aggressive engineering-research programs ever designed for developing protection against corrosion was quickly put into effect.

This cooperative research project on corrosion, sponsored by the Natural Gasoline Association of America, has been placed with the staff of Battelle Memorial Institute at Columbus, Ohio, under Dr. H. A. Pray. In conjunction with the laboratory study, actual tests will be conducted in the gas-condensate fields where corrosion has become a serious menace.

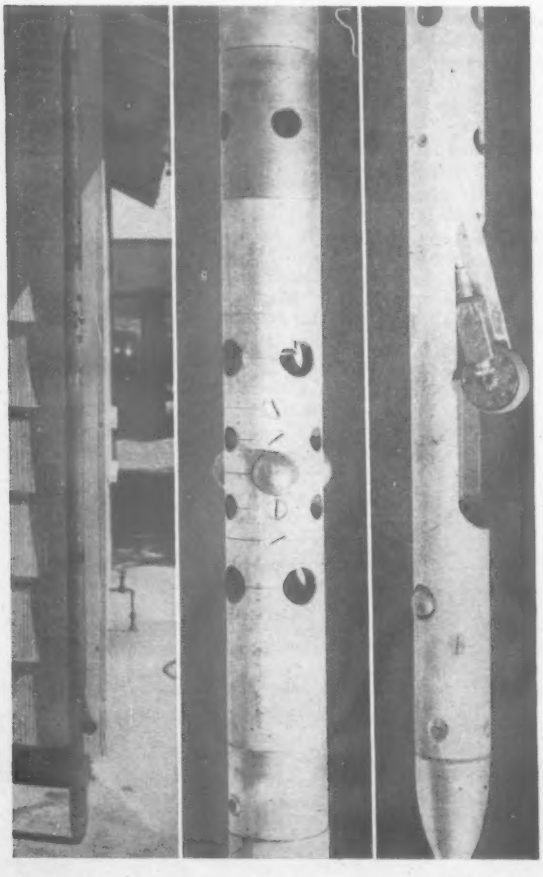


Fig. 1—(Left) Howco recording tubing caliper. Fig. 2—(Center) Closeup of caliper metering head. Fig. 3 (Right) Closeup of tubing caliper showing friction wheel which drives strip chart

While many interested operators believe that this program will be carried out with greater dispatch and thoroughness than any other project of its kind, they fully realize that considerable engineering ingenuity will be required to hold the cost of corrosion at a minimum figure during the time, however short, which may be required for developing an effective method for overcoming the problem.

Typical of the engineering efforts which must be made in the meanwhile to curb the cost of corrosion are those of the Cotton Valley Operators Committee, in the Cotton Valley, Louisiana, gas-condensate field, where well-head pressures average approximately 2,300 p.s.i. In this area, well-head connections, flow lines and the internal surfaces of tubing strings are being seriously affected by corrosion. According to T. W. McGuire, C.V.O.C. production superintendent, well-head connections and flow lines may be periodically inspected at a justifiable cost. Tubing, however, could not be inspected without pulling it from the wells, which in some cases would involve a maximum expenditure of $2,000. This represents the cost of killing a well, rigging up tools, pulling tubing, and making necessary inspection, rerunning, and swabbing in. Aside from the cost of inspecting a string of tubing, when a well is killed there is always some possibility that it may be damaged if foreign material is forced back into the formation. When completely analyzed, the periodic inspection of tubing as a means of preventing parted jobs did not appear feasible as far as Cotton Valley gas-condensate wells were concerned. On the other hand, several strings of tubing had already parted in the field, which emphasized the necessity for arriving at a method to prevent recurrences of this type of trouble.

Thorough Study Made

After a rather thorough study of the problem, C.V.O.C. engineers concluded that an instrument or tool which could be run inside the tubing strings under closed-in pressure to determine the magnitude of corrosion pits, had excellent possibilities as an aid in preventing parted tubing jobs.

At the request of the C.V.O.C. Halliburton Oil Well Co. immediately undertook the problem of working out a recording caliper which could be run on an ordinary measuring line inside of 2½-in. external upset tubing, to determine the extent of corrosion.

This tool was recently completed, and has now been successfully used to survey 12 C.V.O.C. wells. While the caliper is still in the development stage, the results obtained from the runs made at Cotton Valley indicate that it has excellent possibilities for rendering an extremely valuable service to gas-condensate well operators.

Fig. 1 is a photograph of the caliper. The outside diameter is 2 in. and the over-all length, 8 ft. and 3 in. It is equipped with 6-in. jars and a standard fishing neck.

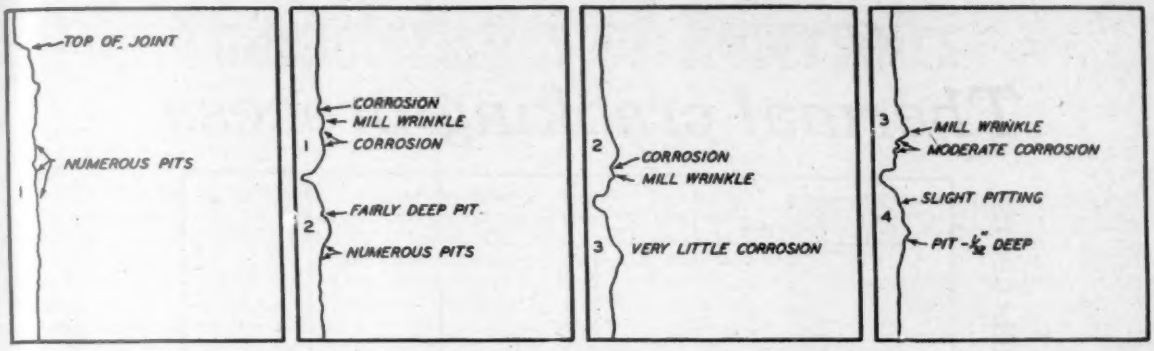


Fig. 4—Typical examples of caliper record taken in C.V.O.C. A-2 Oliphant Hodges

The metering head (Fig. 2) consists of three ⅞-in. steel balls 120° apart, which are forced out against the wall of the tubing by a spring-loaded cone. The ratio of the steel-balls travel to the cone travel is 1 to 1. The use of a large-angle cone avoids the locking effects of the steel balls.

As the steel balls move in and out, the cone moves along the axis of the tool operating a push rod, which in turn actuates a crosshead. Attached to the crosshead is a rod which drives a stylus. This stylus records the changes in tubing diameter on a strip chart. There is also a fixed stylus which provides a reference line on the chart.

Operation of Device

The strip chart is driven from a friction wheel on the lower end of the tool mounted on a spring-loaded arm which forces it against the wall of the tubing. A closeup of this portion of the tool is shown in Fig. 3. Unidirectional spring clutch allows the drive wheel to operate the chart only when coming out of the hole. A spring-loaded dog clutch is provided to allow the tool to be broken down for access to the records. The chart drive roller, driven from the friction wheel through a gear train, drives the takeup spool by means of a spring belt. This belt is removed when the film is rolled off from the takeup roller.

The gasket design employed on the chart chamber allows it to be made up without the use of wrenches. The packing glands on the metering end chart drive shafts have been designed to operate under gas or hydrostatic pressure.

According to McGuire, tubular corrosion in Cotton Valley wells usually occurs inside the tubing string within a few hundred feet of the surfaces. While the interval of tubing which can be surveyed by the caliper amounts to 500 ft., under the existing conditions such a measuring range appears adequate. However, by making several trips a greater length of the tubing string may be surveyed, and a number of C.V.O.C. wells have been calipered down to a depth of 1,500 ft. The corrosion pits in one well were checked down to a depth of 2,000 ft.

The running of the tool is a comparatively simple matter and its insertion in the tubing at the surface is accomplished in the same manner as the bottom-hole pressure bomb. The total time required to survey a well amounts to only 1½ hours. Additional surveys of 500 ft. can be made in about 45 minutes.

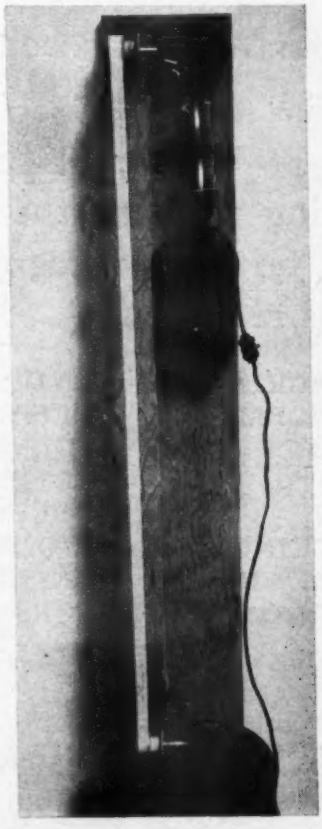


Fig. 5—Electrically operated chart roller for analysis and comparison of two records taken in same tubing string. Interval between runs may be several months, depending upon rate of corrosion

The strip chart record obtained is ⅝ in. in width and 1 in. on the record is equal to 1 ft. of tubing. Fig. 4 shows typical examples of the records obtained in the vicinity of the collars only, in a Cotton Valley well. The numbers shown refer to the joint number below the tubing hanger.

To facilitate examination and analysis of the long strip record, C.V.O.C. engineers designed an electric-motor-operated strip roller. In referring to Fig. 5 it will be noted that the device is equipped with two spools. This permits a comparative examination of two records from the same well taken at different times. The time interval between surveys will vary from well to well. However, judging from the present rate of corrosion it appears that it will be unnecessary to run a survey on the same well any oftener than once every 6 months.

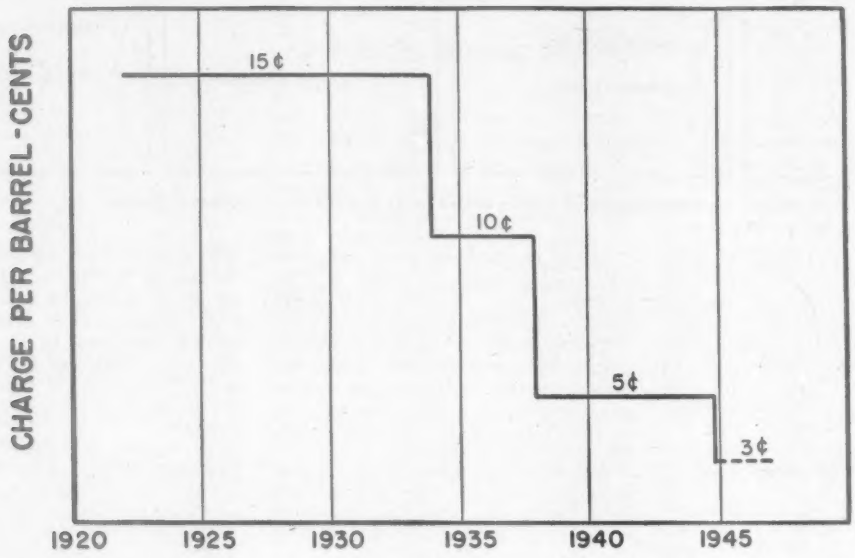
Cooperate With N. G. A. A.

The C.V.O.C. has outlined a rather broad program for the study of corrosion which is scheduled to begin shortly after the first of the year. This, of course, will be in cooperation with the N.G.A.A. project on corrosion. The program includes a caliper survey of all regular producer and test wells in the field. From this survey a good conception of the corrosive characteristics of each well should be obtained. It will then be possible to prepare a time schedule for repeat surveys on each well.

In addition to this work, the C.V.O.C. plans to insert test coupons of various types of steel at points where corrosion has been severe. Its program also includes the investigation and possible trial of plastic-coated tubing and well-head connections as a means of combating the type of corrosion occurring in high-pressure gas-condensate wells.

James D. Berry, Oil City, Pa., oil producer and a director of Quaker State Oil Refining Corp., has been elected a director of Oil City National Bank.

Thermal cracking process



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Characteristics of Reservoirs

*by Park J. Jones**

PART 10 OF A SERIES

The outstanding characteristics of reservoirs is nonuniformity. Productive areas vary from a few acres up to several thousand acres. The shape of productive areas may be circular, elliptical, or like that of a cigar. If limited by faults, the shape may be semicircular or like a piece of pie. If limited by pinchouts, the shape may be elongated and sinuous.

The average pay thickness within productive areas ranges from a few feet up to several hundred feet. The dip may be less than 1° or it may be 90° or even overturned. The pay thickness with a given reservoir ranges from zero up to a maximum. The maximum thickness may be near the center of a productive area or it may be somewhere along a perimeter.

The porosity of pay varies from as low as 5 per cent up to about 35 per cent. The permeability of pay ranges from a fraction of a millidarcy up to several million millidarcies. The interstitial water content of reservoirs may be anywhere from 5 per cent of porosity up to 65 per cent. A barrel of reservoir space may contain nearly a barrel of oil or it may contain only gas.

A comparison of the characteristics of a given stratigraphic interval within a reservoir commonly shows a variation from one well location to another. A study of the logs from a given well show a still greater variation in the vertical direction. In short, the outstanding characteristic of reservoirs is nonuniformity.

Nonuniformity makes one reservoir different from all other reservoirs. Nonuniformity makes the upper part of the reservoir different from its lower part. And nonuniformity makes one end of a reservoir different from its other end.

Mechanics of Producing Oil, Condensate, and Natural Gas

These vertical and areal variations are controlling factors in locating wells and completing wells. They also influence producing and operating methods, rate of recovery, ultimate recovery, and the cost per unit of ultimate recovery.

A DIAGRAMMATIC illustration of pay in a section of a reservoir is given in Fig. 10-1. Fig. 10-2 illustrates an areal distribution of pay in a reservoir. In addition to sectional and areal distribution of pay, we are also interested in the volumetric distribution of pay. Fig. 10-3 gives two illustrations how the volume of pay may be distributed in reservoirs. Data of the type shown in Fig. 10-3 have several applications in the field.

For example, suppose each quarter of the total pay must be produced separately because of impermeable breaks between the quarters over a substantial portion of their respective productive areas. If either curve (A) or curve (B) of Fig. 10-3 were the bottom-to-top distribution of pay, the following results would be indicated:

Quarter	Per cent of total pay— Curve (A)	Curve (B)
1	32	68
2	28	20
3	22	8
4	18	4
	100%	100%

It follows from the foregoing considerations that the location, number, and completion of wells, should, among other things, be influenced by the volumetric distribution of pay. This conclusion is based on the assumption that a reservoir contains one or more impermeable breaks and that the breaks have considerable areal extent.

*Production consultant, Houston.

The average pay thickness of a reservoir is customarily expressed in terms of its proved acreage. It equals the proved acre-feet divided by the proved acreage. Proven acre-feet may be obtained by planimetering isopachous maps. It also may be obtained from sections and scale models.

Fifty per cent of the pay in most reservoirs is found within the bottom one-third between the lowest and highest productive levels. The elevation within a reservoir above and below which the volume of pay is approximately the same is called the midpay datum. Some types of computations are made in terms of the pressure and temperature at the midpay datum. If a reservoir contains a gas cap, two midpay datums may have to be used. One for the gas and one for the underlying reservoir liquid.

The volume of pay in the upper one-third of a reservoir is usually small compared to that in the bot-

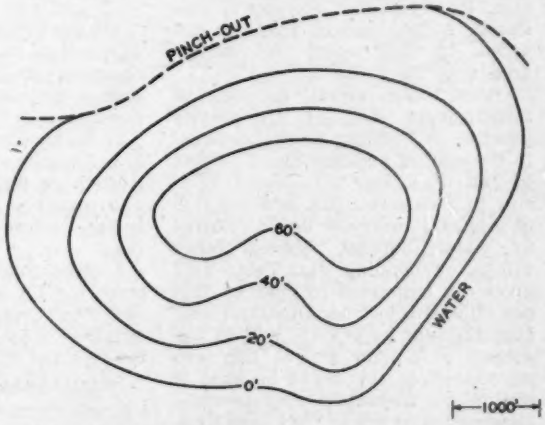

Fig. 10-2—Plan view of pay distribution in a reservoir

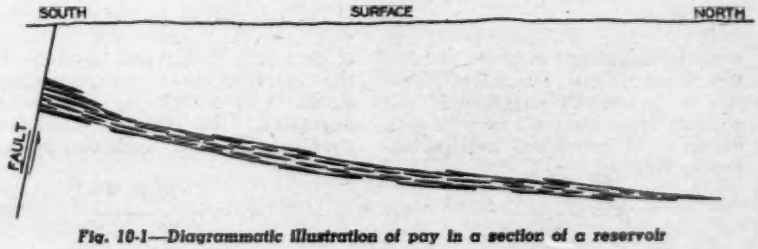

Fig. 10-1—Diagrammatic illustration of pay in a section of a reservoir

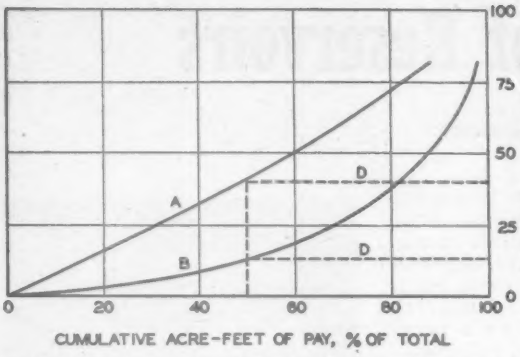

Fig. 10-3—Illustrating two volumetric distributions of pay in reservoirs and corresponding positions in midpay elevations

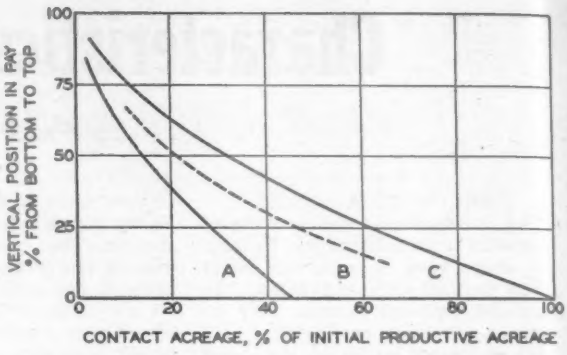

Fig. 10-4—Illustrating effect of vertical position in pay on acre of contact for (A) edge water, (B) gas cap, and (C) bottom water

tom third. For this reason the areal extent per unit thickness is commonly much smaller in the upper than in the lower portion of a reservoir.

Distribution of Contact Acreage

Another characteristic of reservoirs which may influence rate of recovery and ultimate recovery is contact acreage. Fig. 10-4 illustrates relative contact area for bottom water, edge water, and a gas cap in terms of the initial productive acreage.

The contact area for bottom water decreases as water encroaches into a reservoir. The area of contact for edge water starts at some fraction of the total productive acreage. It commonly decreases as water encroaches into a reservoir. The area of contact for a gas cap starts at a fraction of the initial productive acreage and increases upon expansion. However, if a gas cap is produced, a gas contact may be elevated. In that event the contact area may be reduced.

Other things equal, the rate of displacement of fluids by gravity parallel to bedding is proportional to the sine of bedding dip. The rate of fall of a reservoir liquid relative to a reservoir gas and the rate of rise of a reservoir liquid relative to water depend, among other things, on bedding dip. Table 10-1 gives dip expressed in degrees, feet per mile, and feet per thousand feet. Displacement by gravity will be the subject of a later article. Dip was introduced at this point because it can be an important characteristic of some reservoirs. Well locations, well completions, and producing methods can be influenced by gravity and dip.

The porosity of a reservoir is customarily expressed in terms of acre-feet of pay. If the variation in porosity is practically negligible, the porosity for a reservoir may be estimated from individual well porosities as follows:

$$f = \frac{\Sigma\, h_w f_w}{\Sigma\, h_w} \qquad (1)$$

TABLE 10-1—DIP EXPRESSED IN DEGREES, FEET PER MILE AND FEET PER THOUSAND FEET

Degrees and minutes		Feet per mile	Feet per 1,000 ft.
0	20	30.72	5.8
0	40	61.44	11.6
1	0	92.16	17.5
1	20	122.9	23.2
1	40	153.6	28.1
2	0	184.4	35.0
2	20	215.1	40.8
2	40	245.9	46.6
3	0	276.7	52.5
3	20	307.5	58.3
3	40	338.4	64.1
4	0	369.2	70.0
4	20	400.1	75.8
4	40	431.0	81.6
5	0	461.9	87.7
5	20	492.9	93.5
5	40	523.9	99.0
6	0	555.0	105.0

where

f = average porosity for a reservoir
h_w = feet of pay in wells
f_w = average porosity for h_w feet of pay

On the other hand, porosity varies as much as 100 per cent across some reservoirs. In such instances the procedure for estimating the average porosity may be as follows:

1. Prepare an isopore map.

2. Superimpose the corresponding isopachous map on the isopore map and multiply pay thickness by the isopore values at points of intersection.

3. Recontour to obtain isopachs corrected for variation in porosity.

4. The average porosity is then obtained with the aid of a planimeter and the following equation:

$$f = \frac{\text{Acre-feet corrected for porosity}}{\text{Acre-feet of pay}} \qquad (2)$$

Distribution of Interstitial Water

The interstitial water of a reservoir is usually expressed in terms of acre-feet of pay and porosity. If the variation in water saturation across a reservoir is practically negligible, the water saturation above the zone of transition is defined by:

$$W_s = \frac{\Sigma\, h_w f_w W_w}{\Sigma\, h_w f_w} \qquad (3)$$

where

h_w = feet of pay in a well above zone of transition
f_w = porosity of h_w feet of pay
W_w = interstitial water for $h_w f_w$
W_s = interstitial water above zone transition

If the areal variation in water saturation above the zone of transition is significant, a procedure for estimating the average water saturation similar to the one for estimating average porosity may be used.

The significant variation in water saturation of most reservoirs is in the zone of transition. A method for estimating the water saturation of an entire reservoir is illustrated in Fig. 10-5. The following steps are indicated:

1. Prepare two cross-sections of pay thickness at right angles to each other. Three or four sections may be required for irregular-shaped reservoirs. Pay thickness may be expressed in per cent of the minimum pay thickness.

2. Plot individual well data on water saturation above the zone of transition, the x points in Fig. 10-5.

3. Draw a line in each section to represent (1) the elevation of the upper limit of the zone of transition and (2) the water saturation above the zone of transition. In the example, the two lines coincide at 10 per cent of the pay thickness and 10 per cent interstitial water above the zone of transition.

4. Extend the water saturation line by drawing curves at each end to the water saturation at the water contact, 100 per cent in the example.

5. Estimate (1) the average water saturation in the zone of transition, 40 per cent in the example, and (2) the per cent of acre-feet in the zone of transition, 15 per cent in the example.

6. The sum of the products of per cent acre-feet and water for above and in the zone of transition is the interstitial water for a reservoir, 14.5 per cent in the example.

The quantity of hydrocarbons in

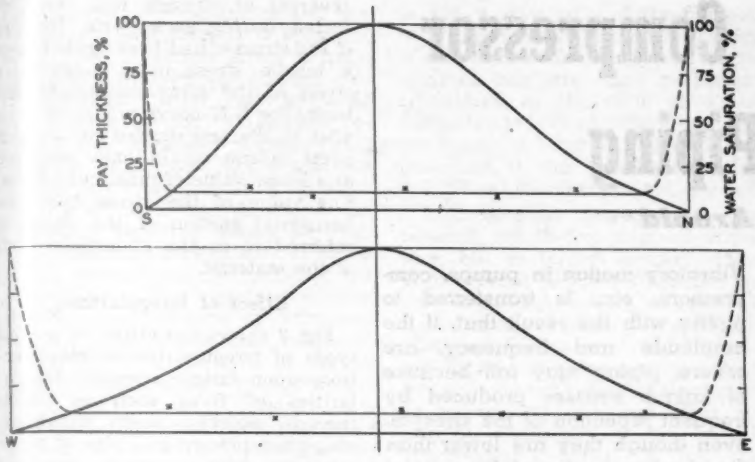

Fig. 10-5—Illustrating method for estimating interstitial water in reservoirs. Points (x) indicate observed water saturation in wells above zone of transition. Dashed curves show probable water saturation in zone of transition. Volume of pay in zone of transition, 15 per cent. Average water saturation in zone of transition, about 40 per cent. Estimated interstitial water for reservoir, 14.5 per cent

place may be estimated without preparing a separate map on pay thickness, porosity, and interstitial water. Instead, all three factors are combined as in the following equation:

$$S/a = 7{,}758\, h_w f_w (1 - W_w) \quad (4)$$

where

S/a = barrels per acre of hydrocarbons in place
h_w = pay thickness in a well
f_w = porosity of h_w feet of pay
W_w = interstitial water for $h_w f_w$

The values of S/a for individual wells are contoured and the result gives the number of barrels of reservoir liquid or reservoir gas in place for each acre of pay. Fig. 10-6 is an illustrative example.

In preparing a map on barrels of hydrocarbons in place for reservoirs having a water contact, the bottom contour next to the zero contour should correct for the higher water saturation in the zone of transition.

Development and production practices are influenced by the distribution of permeability in reservoirs. The variation in the permeability of sandstone pay may be anywhere from tenfold up to a thousandfold. The corresponding values for limestone and dolomite reservoirs may be 10,000 fold up to 1,000,000 fold. In addition, the pay in most reservoirs is locally separated by lenses or laminae of impermeable nonpay.

Several methods have been proposed for mapping the changes in permeability that are found in reservoirs. The writer finds it advantageous (1) to group pay by stratigraphic intervals, using impermeable breaks having significant areal extent as a basis for grouping and (2) to group the permeability of pay in tenfold class limits. For example, if the range in permeability for a given reservoir were from 10 md. up to more than 1,000 md., the following class limits would be used: 10-100, 100-1,000 and 1,000+.

The next step is to map out the pay thickness in the stratigraphic intervals above and below major impermeable breaks. If most of the pay in a given stratigraphic interval falls within a class limit, that class limit is assigned to the interval. If there are significant variations, isoperm maps are prepared for each interval.

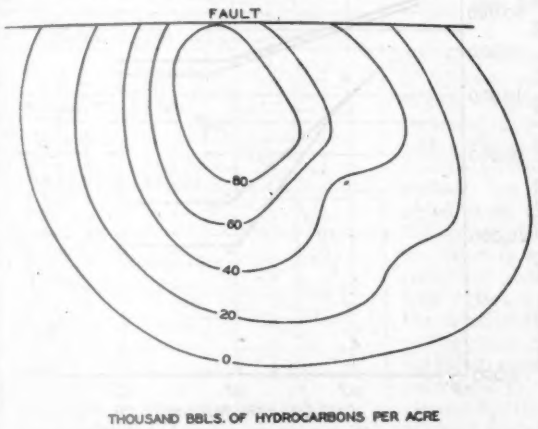

Fig. 10-6—Illustrating distribution of hydrocarbons in reservoir

Maps showing the distribution of pay and permeability by intervals are a picture of the thickness and areal extent according to the quality of pay. A set of such maps for a given reservoir is of value in locating, completing, and producing wells. Such maps may also be helpful in formulating rates of withdrawal, or injection, by stratigraphic intervals.

Multiple-Reservoir Fields

Many fields are underlain by two or more reservoirs. But some fields are underlain by as many as 20 reservoirs. Faulting is commonly one of the causes of multiple-reservoir fields.

The hydrocarbon content of the individual reservoirs may be dry gas, wet gas, retrograde gas, or reservoir gas underlain by some reservoir liquid. The liquid phase in some reservoirs may be distributed in the form of a thin sheet or as a wedge, ring, or halo. Some of the reservoirs underlying a multiple-reservoir field may contain reservoir liquid and a small gas cap or undersaturated liquid having no gas cap.

Two general methods have been worked out for producing multiple-reservoir fields. They are called parallel operations and series operations. Parallel operations refer to producing two or more reservoirs simultaneously. Wells are designed in groups, and each well of each group is scheduled for two or more reservoirs. The wells may be completed singly or dually.

Series operations refer to producing one reservoir after another with a given group of wells. However, a multiple-reservoir field may have several groups of wells in series operations.

The production programs for multiple-reservoir fields usually consist of some combination of parallel and series operations. The usual controlling factors in such producing programs are (1) constant rate of barrels of liquid recovery, (2) constant rate of thousand cubic feet of gas production and injection, (3) optimum number of producing and injection wells and (4) optimum size of plant.

Obviously, mapping for multiple-reservoir fields should reflect differences among reservoir as to (1) the composition of the hydrocarbons in place, (2) number of wells required per reservoir, (3) per-well producing and injection capacity by reservoirs, (4) probable life of each reservoir, and (5) probable ultimate recovery from each reservoir. The basic principles of production are the same for a multiple-reservoir field as for a one-reservoir field. But they have to be adapted to fit each particular case.

Vibration in Compressor Plant Piping

*by M. L. Arnold**

Vibratory motion in pumps, compressors, etc., is transferred to piping with the result that, if the amplitude and frequency are severe, piping may fail because of fatigue stresses produced by frequent repetition of the stresses, even though they are lower than the maximum stress-failure point of the material. The amount of damping required to barely stop the vibration of a member is called the critical damping. The author discusses means for arranging compression equipment so that periodic disturbing forces are eliminated and designing piping systems so they are not affected appreciably by periodic disturbing forces which cause serious vibration. This article was presented as a paper at the California Natural Gasoline Association meeting December 7.

THE use of compression equipment at high rotative speeds and high operating pressures has made many of us uncomfortably aware of a phenomenon called vibration, which arises specter-like and imparts the shakes to piping, designers, and operators. After once having been responsible for a condition of this kind, engineers dream of designing a plant which is entirely free of vibration.

This article will describe the avenues by which the engineer may be able to approach this Utopia. But first will be briefly discussed the mechanical effect of vibration on piping, the mechanics of vibration, and the origin of the forces causing vibration in compressor-plant piping.

If piping is subjected to a stress statically applied, it will rupture only if the stress exceeds the ultimate tensile stress of the metal composing the pipe wall. However, if the pipe is subjected to repeated bending, such as occurs during vibration, rupture may occur even though the maximum stress in the metal has been far less than the ultimate tensile stress. Rupture of this type is referred to as fatigue failure.[1]

In general, fatigue failure due to vibration is more likely to occur in highly stressed portions of the piping system, such as expansion bends, than in less stressed portions such as straightruns. Failure will occur earlier if the magnitude, or amplitude, of the vibration is large than if the amplitude is small. It will occur at points where nonuniformities such as notches or changes in cross-section occur, rather than in uniform sections of piping.

Some of these points are illustrated in Figs. 1, 2 and 3. Fig. 1 shows that the number of times a piece of steel can be bent before rupture occurs increases as the maximum bending stress decreases. The stress was varied from that shown on the figure to zero and back during each cycle. Such a curve is called an S-N curve. If a complete reversal of stresses had been effected during each cycle, that is, if the stresses had been varied from a tensile stress to a compressive stress of the same magnitude and back, the S-N curve would be parallel to the one shown, but at each point failure would have occurred at a lesser value of maximum stress. The value of the stress over the horizontal portion of the curve is referred to as the endurance limit of the material.

Effect of Irregularities

Fig. 2 shows the effect of various types of irregularities in cross-sections upon fatigue strength. Irregularities of form such as holes, threads, notches, sharp shoulders, etc., when present in a pipe or other member may produce localized stresses. These stresses may be much greater than the stress calculated by the ordinary formulas of mechanics. For this reason irregularities in section must be considered in estimating the fatigue strength of piping.[2]

Fig. 3 illustrates the effect of maximum stress and stress range upon endurance strength. The ordinate is in per cent of the ultimate tensile

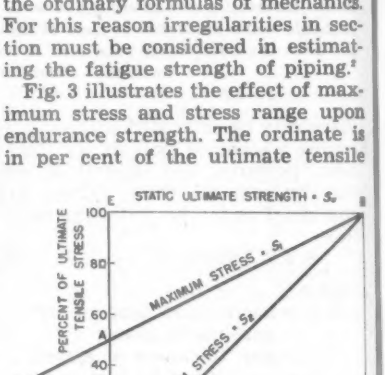

Fig. 3 — Goodman's diagram — effect of stress and stress range on endurance strength

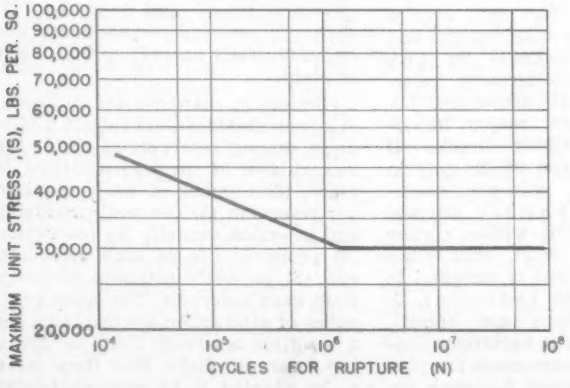

Fig. 1—Typical S-N diagram for a ferrous metal

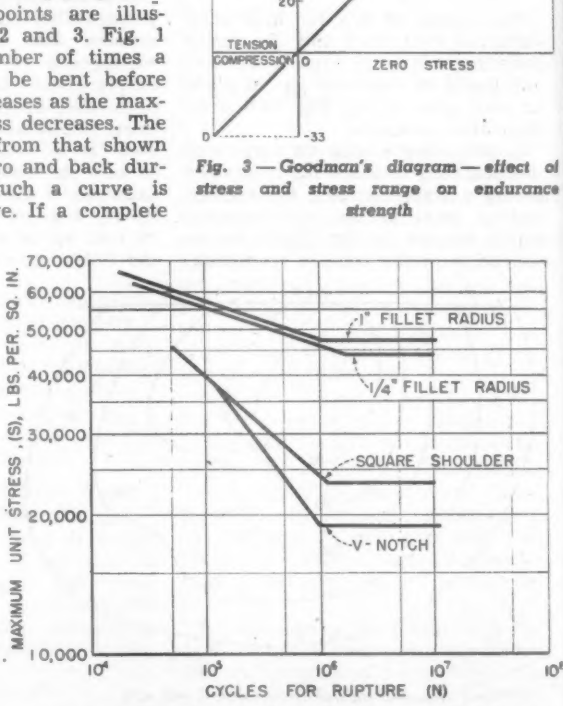

Fig. 2—S-N diagram for specimens of irregular cross section

*Richfield Oil Corp.

strength of ferrous metal and the abscissa is arbitrary. It is apparent that if the maximum stress is high, only a small range of stresses can be tolerated during each cycle. If a complete reversal of stresses occurs, the maximum permissible stress is 33 per cent of the ultimate tensile stress.[3] If the maximum stress is greater than that shown in the diagram, then the range between the maximum and minimum stress must be reduced by reducing the amplitude of the vibratory motion.

The simplest type of vibratory motion is known as free harmonic vibration.[4] It is the type of motion which would be described if a system composed of a weight suspended on a frictionless spring were set in motion in a frictionless medium and no external force acted upon it. If friction is present, either in the spring or in the medium, the resulting motion is called free damped vibration.

The maximum displacement of a vibrating member, such as the weight referred to, is called the amplitude of the vibration. The movement from one position of maximum displacement, through the mean position to the opposite position of maximum displacement and return to the original position is known as a cycle, the time required to complete one cycle as the period, and the number of cycles described per unit of time as the frequency.

If a system capable of vibrating is set in motion, and no retarding forces act upon it, the frequency at which it oscillates is known as its natural frequency of vibration. If the motion is retarded (damped), both the amplitude and the frequency of the motion are diminished.

If the retarding force is increased gradually, a value will be found for which the system will not vibrate, but when displaced from its position of rest, will slowly return to this position. The amount of damping just sufficient to effect this is called "critical damping."

The effect of damping on the natural frequency of vibration is given in Fig. 4. The ratio of the damped to the undamped natural frequency is shown as a function of the coefficient of damping. This coefficient is defined as the ratio of actual damping to critical damping. For the degree of damping ordinarily experienced it can be assumed that the natural frequency is not affected.

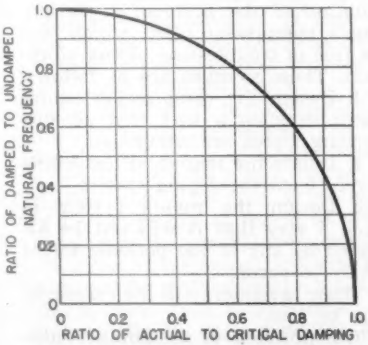

Fig. 4—Effect of damping on natural frequency of vibration

In compressor plants we are interested, not in free damped vibration, but in forced damped vibrations. Forced damped vibrations result from the action of periodic forces upon a system susceptible to vibration. Examples of such disturbing forces are those resulting from the periodic explosions of the charge in power cylinders and from the periodic discharge of gas from a compressor cylinder. If the frequency of the periodic force is the same as the natural frequency of vibration of the system to which it is applied, the periodic force is said to be in resonance with the system.

In general, the preceding remarks, and those which follow, apply to any system in which the static deflection of a member is a linear function of the force applied. A piece of pipe with the ends supported is such a system. Fig. 5 shows

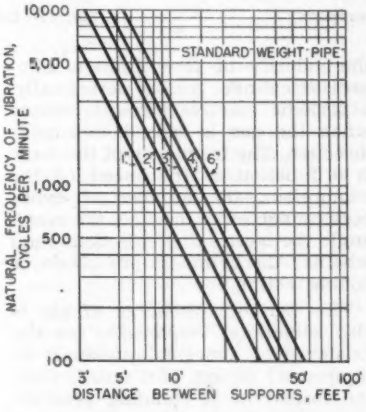

Fig. 5—Natural frequency of vibration of pipe with supported ends

the natural frequency of vibration of various sizes of pipe supported in this manner, for various distances between supports.

If a force is statically applied to a section of piping supported as described, the deflection can be computed from the usual formulas for deflection of beams. However, when the force is applied periodically, the resulting deflection, or amplitude, may equal, exceed, or be less than the computed static deflection.

The ratio between the deflection obtained when the force is applied periodically and the deflection caused by the same force statically applied is called the magnification factor.

This factor is variable with the ratio of the frequency of the applied force to the natural frequency of vibration of the system and with the coefficient of damping of the system. The relationship is shown in Fig. 6. As shown by the figure,

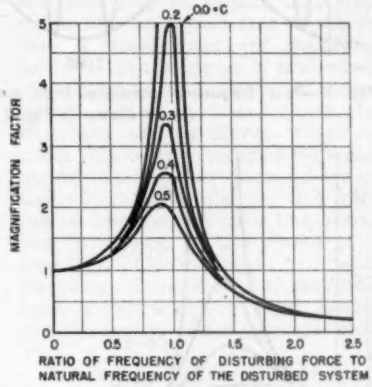

Fig. 6—Magnification factor

at resonance, a small disturbing force can cause a forced vibration of large amplitude.

If several disturbing periodic forces act simultaneously on a system, the amplitude of the forces adds algebraically. If the forces are of different frequency, beat frequencies result. For example, if the two periodic forces shown in Fig. 7

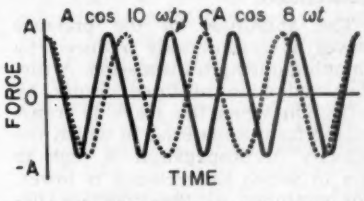

Fig. 7—Graphical representation of force causing harmonic vibration

act simultaneously on a system, the beat frequencies shown in Fig. 8 result.

The disturbing periodic forces with which we are concerned in compressor plants originate from two sources. These are the rotating and reciprocating parts of the engine and compressor, and the discharge of gas from the compressor cylinders.

The magnitude of the forces created by the moving parts depends largely upon the degree to which these parts have been counterbalanced. The frequency of the force is a function of engine speed and the number of cylinders.

These forces are transmitted as pressure waves through the frame of the engine to the foundation and thence to the surroundings and piping. The pressure waves travel at a speed approximately equal to the velocity of sound in the material

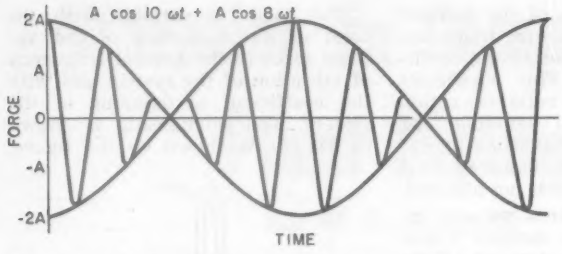

Fig. 8—Beat frequency resulting from simultaneous action of forces shown in Fig. 7

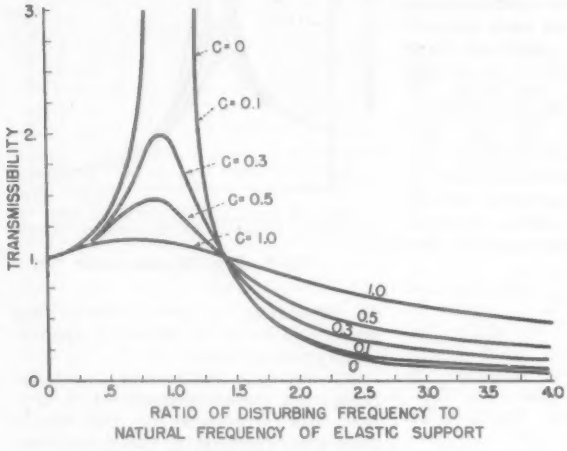

Fig. 9—Transmissibility of elastic supports

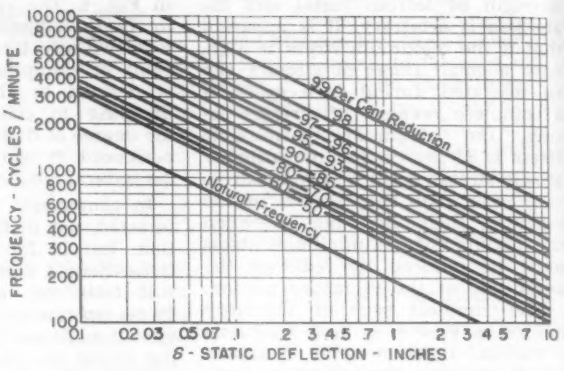

Fig. 10—Vibration isolation frequency—static deflection chart

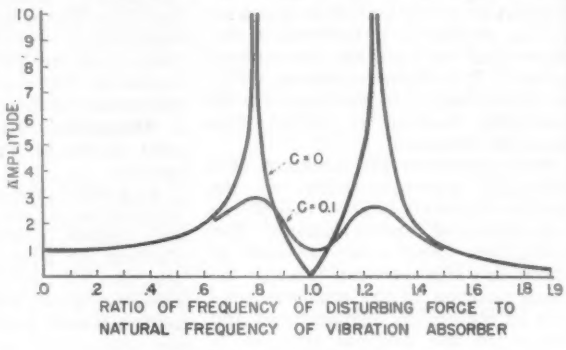

Fig. 11—Effect of dynamic vibration absorbers

through which the wave is being transmitted.[8]

The amplitude of the pressure waves is considerably reduced by damping during transmission. A further reduction in force occurs by reflection when the wave is transmitted from a material in which the velocity of propagation is high to one in which the velocity is lower. For example, at the interface between the cast iron bed plate and the concrete foundation, approximately 73 per cent of the force of the wave is reflected back into the engine frame. The force is further reduced as the wave passes from concrete to dry earth. Even though these forces are greatly diminished before reaching the piping, they cannot be dismissed as possible causes of vibration. For it has been shown in Fig. 5 that at resonance, the magnification factor may approach infinity, and very small forces cause vibrations of large amplitude.

The disturbance due to the periodic discharge of gas from the compressor cylinder is evidenced principally at points of change in direction of the piping. For when a fluid flowing through a pipe is made to change directions, as at a tee, elbow, or pipe bend, a reactive force is created. The magnitude of this force is proportional to the mass velocity of the flowing fluid and to the change in direction.[9] Since the velocity of flow from a compressor cylinder varies periodically, a periodic reactive force is created when the gas is caused to change direction. The frequency of the force is a function of the speed of the compressor, the number of cylinders connected to the line, the crank angle between the cylinders, and whether the cylinders are single or double acting.[9]

This periodic discharge of gas is also sometimes responsible for the existence of abnormal pressures in compressor piping. This results from the formation of standing pressure waves in the piping. These are created by reflection when the length of a discharge pipe is such that its resonant frequency is equal to the frequency of the discharge of gas from the compressor cylinder. The resonant frequency of a pipe is a function of its length and the velocity of sound in the gas flowing through it.[10]

Summary of Theory

At this point we are in a position somewhat similar to that of a young man who has been sitting on a pier listening to a lecture on the theoretical aspects of swimming, such as the laws of gravity and buoyancy, but who has never been in the water. So suppose we all take a deep breath and prepare to try out some of the theory we have been listening to. But before actually taking the plunge, it might be well to briefly summarize the discussion so far. It can be done as follows:

1. Vibration in compressor-plant piping is caused by periodic forces originating in the compression equipment.

2. These periodic forces are transmitted from the equipment to the piping either through the foundations and surroundings or by means of the flowing gas.

3. The vibration resulting from the application of these periodic forces to the piping is most likely to be destructive if the frequency of the forces is approximately equal to the natural frequency of vibration of the piping.

This summary indicates that there are three avenues of approach to the solution of the problem of designing a compressor plant which will be free of troublesome piping vibration. These avenues are as follows:

1. Design the compression equipment in such a way that all disturbing forces are eliminated.

2. Isolate the sources of disturbing forces from the piping system.

3. Design the piping system in such a way that it will not be affected by any of the periodic forces likely to occur.

These avenues will be explored one by one.

The problem of designing equipment which is free of disturbing forces we will leave to the equip-

ment manufacturers. In a paper presented before the association by Engleman and Chrzan, we were told of the extent to which it is possible to reduce engine unbalance.[8]

Forces due to unbalance can also be minimized by resorting to massive foundations. In this respect it has been stated that the soil on which a foundation rests adds considerably to the effective mass of the foundation because the mass of the soil, as well as the mass of the foundation must be accelerated during lateral vibration.[13] This would indicate the desirability of compressor foundations having large spread footings.

The forces arising from the periodic flow of gas from the compressors will probably always be with us, unless reciprocating compressors are replaced with units of the centrifugal or rotary type. The flow from a reciprocating machine can be improved, if instead of a single large cylinder several small cylinders are used, driven by throws uniformly spaced around the crankshaft. This will decrease the amplitude of the disturbance, but the frequency will be increased.

Isolating Disturbing Forces

In other industries much progress has already been made along the second avenue of approach. It has been demonstrated that a source of disturbing periodic forces, such as a gas engine, can be isolated from its surroundings with almost any desired degree of completeness by mounting the machine on elastic supports. For small masses, springs, rubber, corkboard and felt supports are available. For large masses spring, or springs in combination with one of the other materials, are generally used. It is stated that machines weighing up to 450 tons have been satisfactorily isolated in this way.[12]

Buildings have been isolated from vibrations transmitted to foundations by erecting the columns on pads made of alternate layers of lead and asbestos.[12]

Great care must be used in designing elastic supports. If improperly designed, the forces transmitted to the surroundings may be magnified rather than reduced.

The ratio of the force transmitted through an elastic support to the disturbing force is called the transmissibility of the support. The transmissibility is a function of the ratio of the frequency of the force being isolated to the natural frequency of vibration of the elastic support. Fig. 9 shows, for various damping coefficients, how this ratio affects the transmissibility. It is apparent that unless the ratio is greater than 1.414, no reduction is accomplished, and that if the ratio is in the vicinity of one, the force transmitted to the surroundings is increased.

Damping is undesirable for ratios greater than 1.414 unless the disturbing force is of such a variable frequency, that the ratio may approach one during a portion of the operation. In this case, a damping device must be used. It can be adjusted to come into action only in case the amplitude of the transmitted force exceeds a certain value.

Alternative to Isolation

Fig. 10 shows for various disturbing frequencies and percentage reduction of force, the natural frequency required of the elastic support, and also the amount which the support must deflect statically when loaded with the machine which it is desired to isolate.

The theory of elastic engine supports has been discussed at length in a paper by Rosenzweig.[14]

As an alternate to isolating engines from the piping, piping can be isolated from the engines. If it is necessary to support piping from the engine foundations or from structures affected by engine vibrations, elastic piping supports can be used. These may be steel springs if the piping is suspended from a structure, and steel springs or rubber if the piping is supported from the foundation.

In this latter case, the piping can also be protected from pressure waves transmitted from the foundation by causing a portion of the force of the wave to be reflected back into the foundation. This is accomplished by interposing between the support and the foundation a layer of material in which the velocity of sound is low as compared to the velocity of sound in concrete. Examples of such materials are rubber, cork, and dry sand. If rubber is used approximately 80 per cent of the force will be reflected back into the concrete.

The problem of isolating pipe bends from changes in velocity of the flowing fluid is more difficult. Some degree of uniformity of flow in the lines to and from the compressors may be attained by the use of apparatus similar to that used to muffle the exhaust from an engine. However, the problem is more difficult. A muffler attempts only to suppress vibrations in the audible sound range while here we are concerned with securing a constant flow velocity. It may be possible to solve the problem by acoustical methods.[15]

The third and final avenue of approach is careful, intelligent, piping design. Supports should be spaced so that no part of the piping system has its natural frequency of vibration equal or nearly equal to the frequency of any periodic force created by the engine or compressor. As was noted in the discussion of Fig. 6, if the supports are spaced so that the ratio of the frequency of the disturbing force to the natural frequency of the piping is greater than 1.4, magnification factors of less than one can be obtained. This will result in piping which will be almost free of vibration. A disadvantage of designing for ratios in this range is that when an engine is shut down, at some instant before it comes to rest, the frequency of the forces which it emits will be in resonance with the piping. This might cause destructive vibration. While this difficulty can be overcome by installing vibration dampeners on the piping, it is probably safer practice to design for ratios of between 0.25 and 0.50, even though this results in magnification factors slightly greater than one.

Particular attention must be given to supporting piping at points where changes in direction occur. At these points, the piping is subject to both the forces emanating from the engine and those set up by the pulsating flow of gas from the compressor cylinders. In case the change in direction is installed for the purpose of securing flexibility, it may be necessary to use springs or other types of elastic supports.

Neutralizing Pressure Components

It might be possible to eliminate vibration in expansion bends if they were designed to be symmetrical about an axis coincident with that of the main pipe line. In this case components of pressure in all directions, except the original direction of flow, would neutralize each other.

Lengths of piping between the compressor cylinder and the surge chamber or header, and between surge chamber and header, or between headers, should not be equal to the resonant length for the frequency at which gas pulsates in the line. If resonant lengths cannot be avoided, the magnitude of the standing pressure wave formed can be limited by installing a condenser or surge chamber in the line near the compressor cylinder. The required volumetric capacity of the condenser is a function of the piston displacement of the cylinder, the normal pressure in the line, and the permissible pressure rise.[15]

Now, even the best engineers sometimes make mistakes. Either errors of omission, or the other kind. So it is always well to have a few aces up the sleeve just in case there is a joker somewhere in the design. The standard method of dealing with a vibrating pipe is to install more supports and more and heavier pipe clamps. This is equivalent to increasing the natural frequency of vibration of the piping. The natural frequency of vibration of a section

of piping can also be increased by attaching a spring to it. The spring is selected and loaded so that the natural frequency of the spring, load, and piping is sufficiently greater than the disturbing frequency to reduce the magnification factor by the required amount.

Another approach as indicated by the magnification factor chart, Fig. 6, is to reduce the number of supports. In this way magnification factors of less than one can be obtained. The hazards of this approach should be kept in mind when it is used.

The amplitude of the vibration can also be limited by the installation of damping devices such as hydraulic shock absorbers or friction-type snubbers.

Another effective means of reducing vibration in piping is the use of dynamic vibration absorbers. These consist of a weight suspended on an elastic member from the vibrating piping. The natural frequency of the weight and elastic suspension should be the same as the natural frequency of the vibrating member. The relationship between the amplitude of the vibration of the original member in such a system and the ratio of the frequency of the disturbing force to the natural frequency of the compensating systems is shown in Fig. 11 for zero damping and for a damping coefficient of 0.10. Inspection of the figures shows that the device cannot be used if the range of disturbing frequencies is too great.

References

1. Johnson, Material of Construction, John Wiley & Sons, 6th edition, p. 771.
2. Roark, Formulas for Stress and Strain, 2nd edition, p. 6.
3. For another type of diagram see Reference 1, p. 783.
4. Marks, Mechanical Engineer's Handbook, McGraw-Hill, 4th edition, p. 509.
5. Engleman & Chrzan-Clark Bros., The Balancing of Gas and Oil Engines.
6. Thornton, Mechanics Applied to Vibration and Balancing, John Wiley & Sons, Chap. 4.
7. Thornton, Mechanics Applied to Vibration and Balancing, John Wiley & Sons, p. 499.
8. Marks, Mechanical Engineer's Handbook, McGraw-Hill, 4th edition, p. 279.
9. Thiel, Calculating Pipe Sizes for Compressor Cylinders, Petroleum Engineer.
10. Olson, Elements of Acoustical Engineering, D. Van Nostrand & Co., p. 47.
11. Slocum, Noise and Vibration Engineering, D. Van Nostrand & Co., p. 44.
12. Freberg & Kemler, Elements of Mechanical Vibration, John Wiley & Sons, p. 97.
13. Slocum, Noise and Vibration Engineering, D. Van Nostrand & Co.
14. Rosenzweig, Theory of Elastic Engine Supports, January 1939, Transactions of the American Society of Mechanical Engineer.
15. Thornton, Mechanics Applied to Vibration and Balancing, John Wiley & Sons, Art. 82.
16. Olson, Elements of Acoustical Engineering, D. Van Nostrand.

Curricula Revised by School of Mines

Georges Vorbe, formerly consulting geologist of Midland, Tex., and since 1943, professor of geology and petroleum engineering at New Mexico School of Mines, Socorro, announces several revisions in the curricula of the School of Mines in geological and petroleum engineering. Among the new offerings is a summer field course, to be given on the completion of the war and the easing of transportation difficulties. The course will last for 6 weeks.

MacLean Houston, United Refining Co., Warren, Pa., was elected chairman of the Technical Advisory committee, Pennsylvania Grade Crude Oil Association, at a recent meeting in Oil City.

Lt. Col. James E. Boudreau, recently released from duty with the Sixth Service Command, has rejoined Ethyl Corp. He will be advertising manager, with headquarters in New York. Colonel Boudreau, a West Point graduate, resigned his commission after a year's service and later joined Ethyl Corp., becoming manager of the New York and Chicago divisions. He was commissioned a captain in the Army in November 1942.

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by Arch L. Foster

Insulating Oil Inhibitors Are Specific in Action

THE universal inhibitor for electrical insulating oils has not been found, says Dr. L. J. Berberich, Westinghouse Laboratories. Such inhibitory compounds include the organic amines, sulfides, and disulfides in various combinations with aromatic and other organic groups. The life of electrical apparatus is long, 20 years or more, and the determination of the long-time stability of an oil and the effectiveness of an inhibitor for long periods is a difficult, costly and very time-consuming undertaking.

The inhibiting action of these additive compounds depends on their individual oxidizability, they being the scapegoat, oxidized selectively in preference to the oil. Therefore when the inhibitor is used up the oil if unstable in itself rapidly forms acids, peroxides, etc., destroying its usefulness. Some investigators believe that oxidation of oil and inhibitor progresses simultaneously, the oxidation products formed being antagonistic and therefore destroying each to regenerate the original compounds and freeing the oxygen.

Three types of inhibitors exist, it seems; those mentioned above retard the oxidation reaction on the oils. The second deactivate the catalyst metal surface, such as copper, to stop its acceleration of the oxidation step as typified by such as tertiary amylphenyl phosphite. A third type may be a sludge solvent, increasing the solvent action of oil on otherwise insoluble and precipitatable material to prevent its deposition; nitrobenzene and nitronaphthalene are examples of these inhibitors. Tests with 2,6-ditertiary - butyl - 4-methylphenol, n-benzyl-p-anisidine, beta-naphthol and diphenylamine show, at 85° C. and in the presence of copper, that the first three are good inhibitors while diphenylamine is only fair in the oil tested.

One inhibitor may be a good antioxidant in one oil and a good oxidation accelerator in another type of oil, according to Dr. Berberich. In a naphthene-base insulating oil—V.I. 76—a ½ per cent solution of Neozone A — phenyl - alpha - naphthylamine—was an effective inhibitor. In a 105 V.I. paraffin-base oil Neozone A promoted oxidation. Inhibitors are very effective in oils refined to approach the white condition, but when used up the oil then sludges and deteriorates with increased rapidity.

Subzero Aircraft Lubricants

THE rapid and extreme changes of temperature encountered by aircraft engines in rising from the ground to substratosphere heights and the consequent strain on the lubrication system and more directly the crankcase lubricating oil presents a major problem to refiners. This condition is doubtless more severe than that found in the heavy-duty diesel engine. Methods for meeting this situation are legion, based mainly on two principles—maintenance of viscosity range with temperature change, and employment of extreme-pressure lubricant materials to support lubricating films under elevated pressure when the viscosity of the lubricant is very low or very high. Artificial heating or coaling of crankcase oils is also resorted to with fair success.

The perfect lubricant from a viscosity viewpoint is one having a zero viscosity-temperature gradient, one which does not change its viscosity with any temperature change. Such a product is not known. Extreme-pressure agents fill in the gap in considerable measure, but leave much to be desired since under conditions other than extreme pressure they are frequently very poor lubricants.

One instance of the trend in these products is that of U. S. Patent No. 2,355,993, issued to J. D. Morgan and assigned to Cities Service Oil Co., which employs aliphatic-substituted aromatics, especially cumene—isopropyl benzene, used currently in aviation fuel—blended with extreme-pressure materials such as tricresyl phosphate, sulfurized animal oil or other liquid material. This lubricant, according to patent specifications and claims, is especially useful at temperatures down to —100° F., while supporting engine bearing loads at desert ground-level takeoff temperatures of 100° F. or higher.

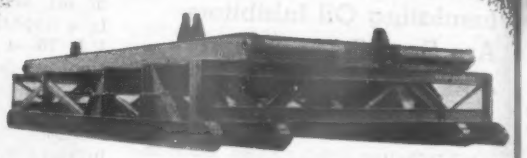
Resin From Rubber Used To Compound Rubber

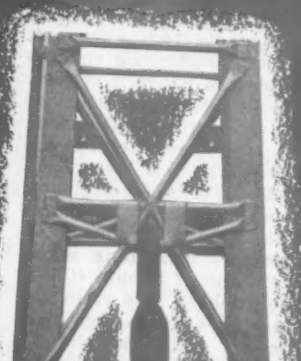
PLIOLITE S-1, S-2, and S-3 are three grade designations of a special resin developed from "a special type of synthetic rubber" for use in compounding of synthetic rubber to make it more suitable for special purposes for which heretofore only natural rubbers have been adaptable. Development of this product is announced by Goodyear Tire & Rubber Co., which states that this advance does not affect the possibilities for the tire division of the industry.

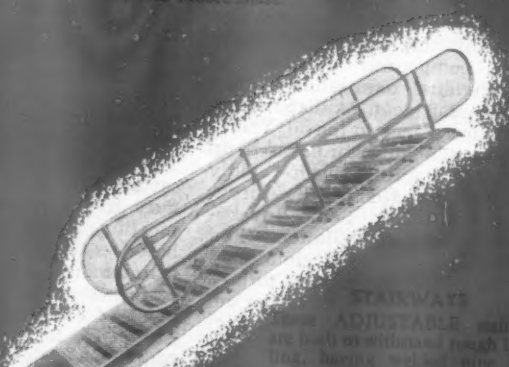
This product is said to replace carbon black in compounding rubber for lightweight products wherein rigidity and impact resistance are required. Replacement of carbon makes synthetic rubber more adaptable where colors are required. It makes rubber, especially synthetic rubber, much more highly resistant to the passage of electric current; carbon black promotes the conductivity of rubber in which it is used. Hardness is in direct proportion to the amount of resin used. The same equipment and general methods are employed to make this resin from synthetic rubber as were originally planned to make resins from natural rubber. The resin is produced in "master batches" containing equal parts of resin and of buna-S (GR-S or tire-type rubber). The resin reduces curing times, gives very high tensile strength and good elongation in finished products. The resin may be compounded with the non-tire, buna-N type of synthetic rubber made from butadiene and acrylonitrile.

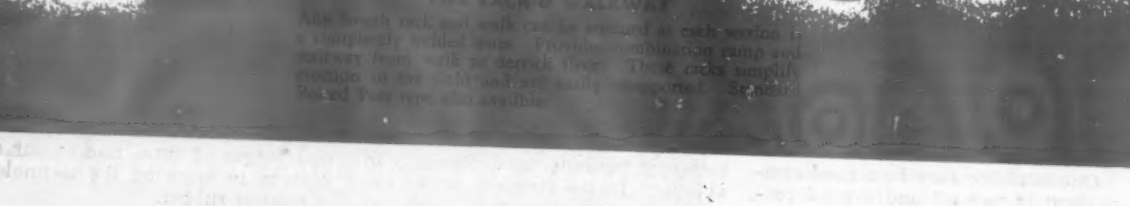
This newest announced advance in synthetic-rubber technology points the way that this field's development will take, doubtless, at a greatly accelerated pace, once war's restrictions and paramount demands are removed to permit research in the interests of peacetime products. It has been said that the highly developed natural-rubber technology was acquired during a century of painstaking, slow research and development; synthetic rubber should reach the same relative stage of development in a small fraction of that length of time, due to our advantage in knowing the technology of natural rubber.

Moore MAST AND AUXILIARY









Bottom-Hole Pressure Data in Conservation and Proration Work*

INFORMATION concerning reservoir pressure is essential to efficient operation of an oil field. Bottom-hole pressure data, therefore, are of primary importance to conservation authorities in fixing production rates and in formulating operating rules. This report gives the views of the Research and Coordinating Committee of the Interstate Oil Compact Commission regarding the measurement of bottom-hole pressures and the application of the data to conservation and proration problems. The report has been prepared for the purpose of furthering the standardization of routine engineering work in the various states.

The term "bottom-hole pressure" as used herein means pressure at or near the face of the producing formation in an oil or gas well, expressed in pounds per square inch gage. "Static bottom-hole pressure refers to the pressure existing at the sand face when the well has been shut in for a sufficient length of time to permit complete or substantially complete equalization between pressure in the well bore and pressure in the surrounding portion of the reservoir. "Producing bottom-hole pressure" refers to the pressure prevailing at the sand face while the well is on production.

In dry-gas wells bottom-hole pressure may be computed from casing-head pressure by addition of the calculated weight of the column of gas in the well. This method may also be applied to oil wells in cases where it is known that no liquid is present in the casing. In most oil wells, accurate bottom-hole pressure data can be obtained only with a recording gage lowered in the well to the sand face. In wells producing oil with a very low saturation pressure, so that no gas is evolved in the casing, bottom-hole pressure can be determined from fluid-level measurements made with a sonic instrument. This report will deal only with the actual measurement of bottom-hole pressure by use of a gage (or "bomb").

Equipment

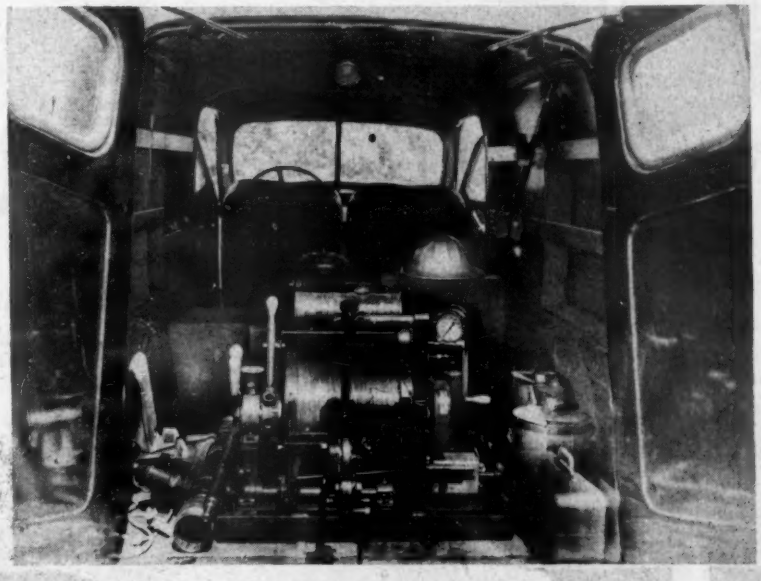
Bottom-hole-pressure gages may be obtained with any desired pressure range up to 7,000 p.s.i. Instruments capable of recording high pressures are less sensitive than lower-range instruments, the accuracy of a given type of gage being inversely proportional to the pressure range. For this reason the pressure range of the instrument selected for use in a field or area should not greatly exceed the maximum pressure to be measured. Gages of the continuously recording type are recommended. The clocks used to drive the chart-holder mechanism are available in various ranges of from 1 to 72 hours. The higher-speed clocks are preferable for measuring static pressure; the longer-range clocks are necessary on producing bottom-hole-pressure tests. All exposed parts of bottom-hole-pressure gages should be of materials resistant to corrosive gases, oils, and waters and to acid. Instruments should be of sturdy construction, capable of withstanding considerable shock; this requirement is of great importance in the case of gages which are to be used on production tests in pumping wells.

To insure accuracy, it is recommended that bottom-hole-pressure instruments be calibrated frequently and at the temperature to be encountered in the bottom of the well. New instruments are subject to greater and more rapid shifts in calibration than are older gages whose pressure elements have become seasoned.

The chief requisite of hoisting equipment used in running bottom-hole-pressure gages is portability. If the automobile assigned to bottom-hole-pressure work is to be used continuously for measuring static pressures, panel or pickup mountings have been found most satisfactory. When the automobile is to be used for other services in addition to transporting hoisting equipment, a trailer mounting is more suitable.

Procedure—Static Pressures

To facilitate interpretation and comparison of data, all static pressures measured in a reservoir must be determined at or referred to the same datum plane. The datum plane should be determined as soon as sufficient data are available to provide a basis for its selection. Since the datum plane must be below the gas-liquid interface, it should be fixed at a level which is expected to be in the liquid column throughout the life of the field. At the same time, because measured pressures are to be preferred to calculated pressures, the datum should be high enough to permit the bomb to be run to the datum depth in a majority of the wells. If the subsequent history of the pool shows the original datum selection to have been unsatisfactory, a new datum plane may be



Inside view of field-testing unit of the Oil and Gas Conservation Department of the Oklahoma Corporation Commission

*Report of Research and Coordinating Committee, I.C.C., presented at Jackson, Miss., meeting, December 14, 1944.

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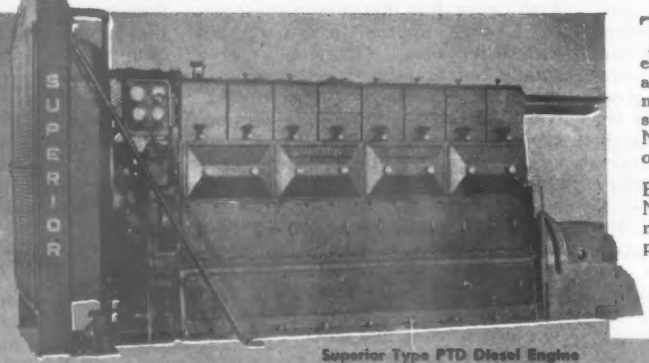

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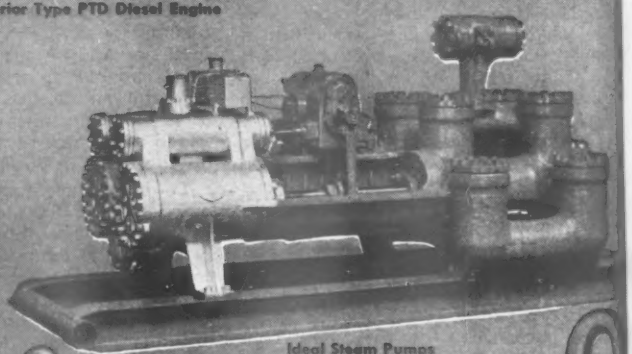

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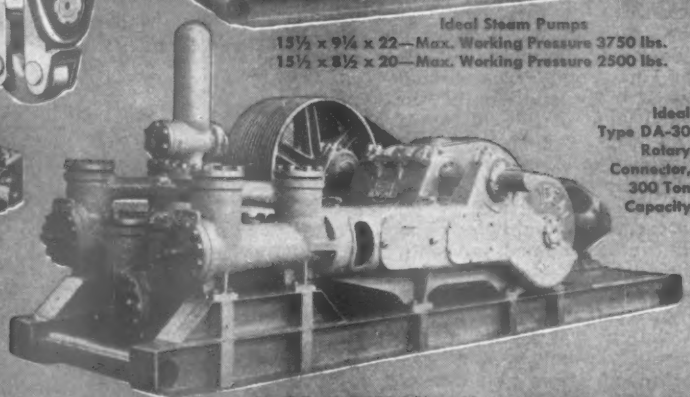

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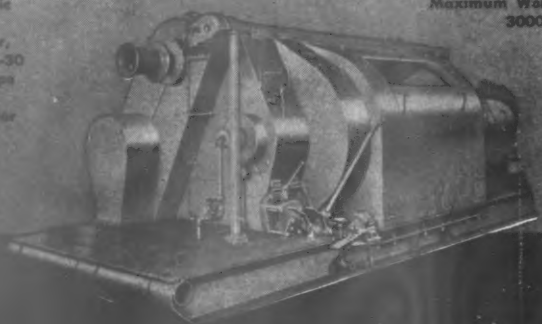

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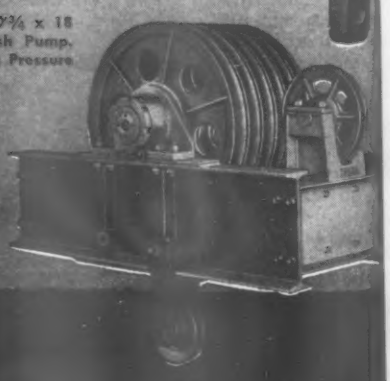
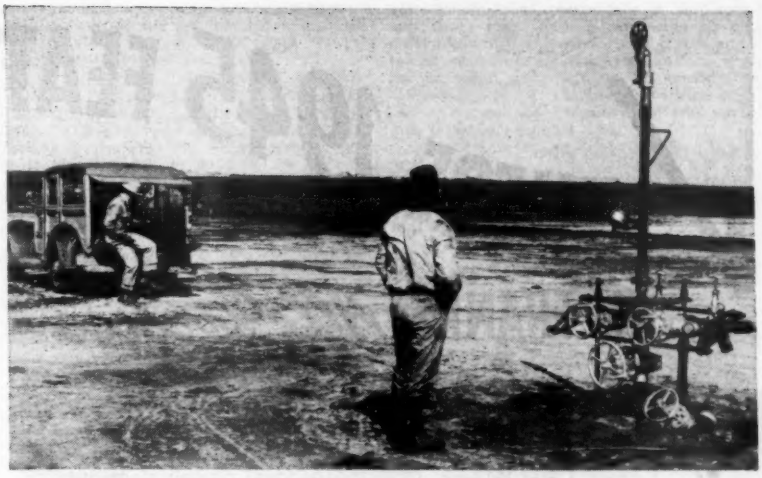


adopted and all earlier pressures corrected to the new depth.

Static pressure must be measured after the well has been shut in long enough to permit substantial equalization between the pressure in the well bore and that in the surrounding portion of the reservoir. The shutin time required to obtain maximum buildup in bottom-hole pressure is largely a function of permeability and varies greatly from pool to pool. The necessary shutin period can be determined only by actual test in each case, but as a general requirement, a minimum shutin time of 24 hours is recommended.

The gage should be left at the test depth long enough for the temperature of the instrument to reach the formation temperature; a minimum of 10 minutes is recommended.



Running bottom-hole-pressure bomb in a South Texas field

Application of Static Bottom-Hole-Pressure Data

The manner in which the production from an oil field should be regulated for maximum recovery depends largely upon the classification of the reservoir as to recovery mechanism, or type of drive. Knowledge of reservoir-pressure behavior (rate of change) is essential to an early determination of the type of drive under which a pool is producing. Bottom-hole-pressure data, therefore, can be of valuable assistance to regulatory authorities in formulating rules and fixing production quotas for new fields.

In addition to aiding in the determination of reservoir classification, bottom-hole-pressure data provide an important check as to the effectiveness of the production-control measures adopted.

Efficient operation of a reservoir under water drive requires that production be so regulated as to permit the water to advance evenly through the reservoir, thus avoiding entrapment of oil through channeling and bypassing. Periodic bottom-hole-pressure surveys indicate the degree to which this end is being accomplished and also indicate what steps should be taken to bring about greater uniformity in water encroachment.

In fields which are producing under gas-cap drive, development of high-pressure differentials within the reservoir induces channeling of gas and causes excessive release of gas from solution. Both of these effects of high-pressure differentials adversely affect recovery efficiency. Bottom-hole pressure data discloses the location of low-pressure areas as they are developed and thus make corrective measures possible. Pressure data are also of assistance in predicting the rate of expansion of the gas cap and in formulating regulations for the control of gas/oil ratios. If pressure maintenance is undertaken, bottom-hole-pressure data are vital to the success of the program.

Pressure data are useful in making possible early identification of pools of the dissolved-gas drive type, so that consideration can be given to the advisability of injecting water or gas into the reservoir and thus inducing a more efficient type of recovery mechanism than the dissolved-gas drive.

Use of Bottom-Hole-Pressure Measurements in Connection With Potential Tests

Allowable allocation formulas in many fields involve the well-potential factor. To establish potential productive ability by actual production tests requires, in many cases, the installation of producing equipment of much greater capacity than would be needed to produce the well's daily allowable. High rates of production on potential tests are also detrimental to the reservoir in some cases. These objectionable features of potential tests may be overcome in many fields by the use of calculated potentials based upon bottom-hole-pressure data obtained at restricted rates of production. The pools in which such potentials are used, however, must be selected with care if accurate results are to be obtained.

The calculation of potential capacity from bottom-hole-pressure measurements is based upon the principle that, under conditions of stabilized flow of a homogeneous liquid into a well bore, the rate of production is directly proportional to the difference between the static bottom-hole pressure and the producing bottom-hole pressure. If both oil and free gas are flowing through the reservoir into the well bore, this simple relationship between production rate and pressure does not prevail, and potential cannot be calculated accurately from pressure data taken at low producing rates. The bottom-hole-pressure method of establishing potentials is best suited for pools operating under a water drive and producing an undersaturated crude. In general its use should be limited to reservoirs of this type.

The procedure to be used on a bottom-hole-pressure potential test must be designed to provide the following data:

1. True static bottom-hole pressure.
2. Uniform, accurately gaged producing rate.
3. Stabilized producing bottom-hole pressure.

The question of the length of shutin time required to obtain substantially complete buildup in static pressure has been discussed above. The bottom-hole-pressure gage should be left on bottom before production is started for a sufficient length of time to indicate whether maximum pressure buildup has been approached.

Production must be maintained at a uniform rate throughout the test. The rate must be high enough to provide a satisfactory basis for extrapolation of the pressure-production rate curve. Ten barrels per hour is recommended as the minimum producing rate. The producing period must be of sufficient duration to achieve stabilization of the producing bottom-hole pressure and to provide an accurate determination of the rate of production. It is recommended that production be continued for 4 hours after the pressure has become stable within the limits set forth below. The percentage of water produced, if any, must be accurately measured.

Because complete stabilization is very difficult to obtain in many cases, it is recommended that a well be considered as stable when the rate of change in producing bottom-

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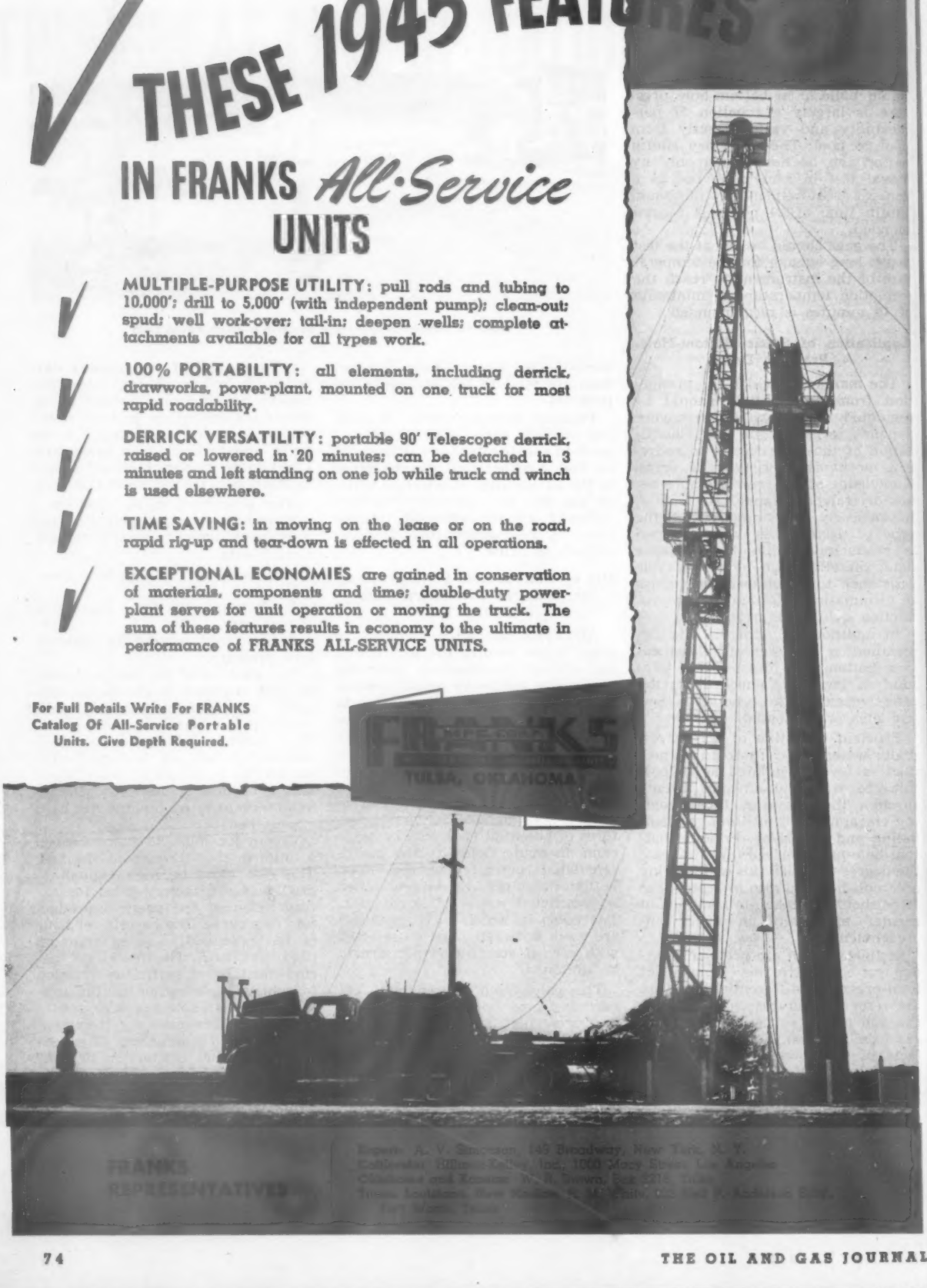


hole pressure is 2 p.s.i. per hour or less, provided the bottom-hole-pressure chart indicates, by change in slope, that stabilization has been closely approached.

The calculated potential of the well (its ability to produce if the bottom-hole pressure were reduced to atmospheric pressure) is obtained by multiplying the observed producing rate by the ratio of the static pressure to the difference between the static pressure and the stabilized producing pressure.

Since the calculated potential of wells in highly permeable formations may far exceed the capacity of the largest producing equipment, it is necessary to set a maximum for potentials taken by the bottom-hole-pressure method. In fixing the maximum, consideration should be given to the performance of the best wells in the field on actual production tests. In the case of a maximum well which produced water, the percentage of water is to be deducted from the maximum to arrive at the potential.

In some water-drive fields the saturation pressure of the oil is so far below the reservoir pressure that no gas is evolved in the annular space. Where this is the case the density of the oil in the annular space is constant, and the fluid level is directly proportional to bottom-hole pressure. Under these conditions fluid-level measurements may be used in calculating potential, and a sonic fluid-level instrument may be used instead of a bottom-hole-pressure bomb. Wells tested in this manner should be tubed to bottom, since raising the tubing may permit gas to be released from solution before the oil enters the tubing, thereby disturbing the density of the oil column in the annular space.

In addition to the useful part which it plays in connection with conservation and proration, bottom-hole-pressure information is also of great assistance in estimating reserves, predicting flowing life of wells, selecting producing equipment, and related production problems. Discussion of these uses of pressure data is not considered to be within the scoue of a report by the Research and Coordinating Committee.

BOOKS

AUDELS PUMPS, HYDRAULICS, AIR COMPRESSORS. By Frank D. Graham. Published by Theo. Audel & Co., 49 West Twenty-third Street, New York, N. Y. 1,658 pp. $4.

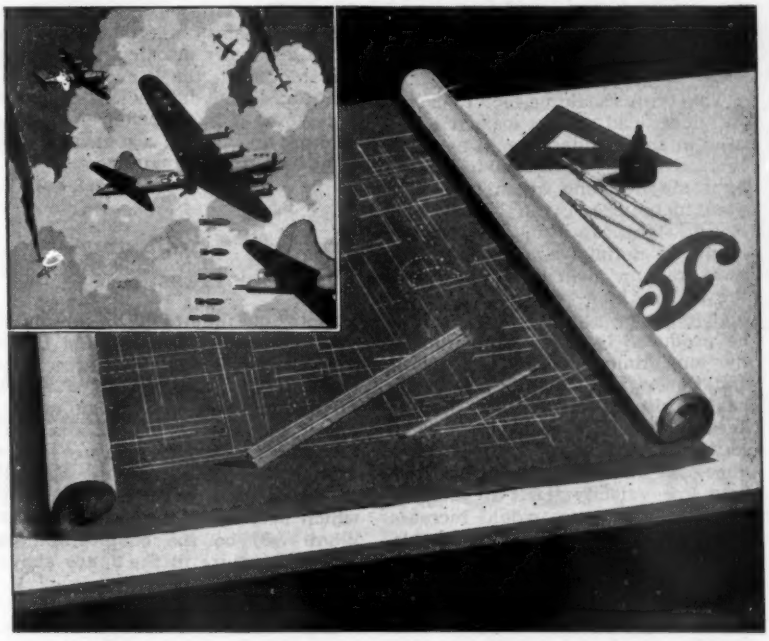
This volume, published in handbook or manual style, is a practical guide covering theory, construction, and operation of modern pumps, hydraulic machinery, air compressors, and blowers, for engineers, mechanics, and operators. The author introduces a large number of elementary or skeleton diagrams to explain basic principles, construction being shown by photographs of the leading manufacturers' latest designs. The book is in question-and-answer style.

A.S.T.M. STANDARDS ON PETROLEUM PRODUCTS AND LIQUIDS, OCTOBER 1944. Published by American Society for Testing Materials, 260 South Broad St., Philadelphia 2. 500 pp. $2.75.

This latest compilation of all A.S.T.M. specifications, methods of tests, and definitions pertaining to petroleum products includes some 80 standards with certain supplementary material. In addition to the current report of the society's Committee D-2 responsible for most of the standards, there are certain proposed methods, for example one on saponification number of petroleum by electronic titration; proposed conversion tables for petroleum oils of metric tons to long tons and short tons. Also a discussion of oil measurement; proposed method of analyzing petroleum sulfonates, and a test for potential gum in aviation gasoline.

Specifications are included covering fuel oils and gasolines, Stoddard solvent, various types of asphalt, etc.

J. Steve Anderson, vice president of Anderson-Prichard Oil Corp., has left Oklahoma City, with Mrs. Anderson, for Miami Beach, Fla., where they will reside. Anderson's change of residence will involve no change in the oil-company organization, he said.



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Soaking Factor in Cracking

Would you please advise me on derivation of term "soaking factor" from the factors of time, pressure, velocity and temperature, in cracking, which I do not find explained in your book, "Petroleum Refinery Engineering" of 1942?—B. E. W.

The term "soaking factor" is not in widespread use; at least it is not used in any standard books or widely read articles. Perhaps it is used by some licensing organizations or plant operators. In any attempt to attach significance to the term, it might be defined as "a factor that measures the degrees or extent of the cracking reaction." Thus, a high or large soaking factor would be produced by high temperatures, by long times, by high pressure, and by low recycle ratios. Velocity has no direct effect other than to keep the metal surface wiped clean so that stagnant liquid does not produce coke on the tubes, but indirectly a low velocity tends to increase the time and hence would increase the soaking time. The relationship between the several factors (i.e., time, temperature and pressure) is so complicated that it is doubted that a single factor can be used to describe it. In commercial equipment the effect of these variables upon one another is even more complicated because the changing of one factor affects many other parts of the operation as well as affecting the other factors. Nevertheless, each particular plant or cracking operation exhibits a characteristic performance or behavior with respect to temperature, pressure, and amount of recycling, which behavior is well known to the plant operators.

Perhaps the most practical way of describing the amount of soaking is by the crack per pass (or conversion per pass). Obviously the crack per pass is the over-all result produced by all of the factors acting simultaneously upon the feed (and recycle) stock. Note that the factors of time, temperature, pressure, velocity, or recycle ratio affect the crack per pass in exactly the same way as stated above for their effect on the so-called soaking factor.

The long soaking times produced by reaction chambers held full (or partly full) of liquid are now frowned upon by all, but there is still some argument between those who believe in long times at low temperatures, and those who believe in shorter times at high temperatures. The latter method produces better octane number but there are certainly many practical mechanical advantages to the use of low temperatures and longer times. Some believe that a relatively long-time soaking of vapor at a somewhat low temperature is advantageous.

Practical Significance Of Vapor Pressure

Motor gasoline of 10 lb. (absolute) vapor pressure is being held in an open half-full container at a constant temperature of 85° F. with no air currents and at an atmospheric pressure of 14.7 lb. abs. Will the gasoline vapor pressure force vapor out of the container or will an equilibrium condition result by which nothing further will happen? What will be the composition of the gas mixture in the space above the gasoline?—F. X. K.

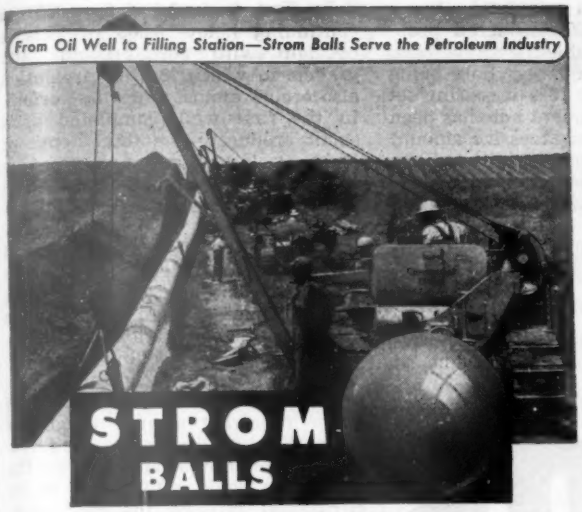
The vapor pressure of a 10-lb. R.v.p. gasoline (at 100° F.) will be only about 8 lb. at 85° F. Under the constant condition stated, part of the gasoline will vaporize until the vapor space contains 8 volumes of gasoline vapor to 6.4 volumes (i.e., 14.7 minus 8) of air. This presupposes that the amount of gasoline is ample to supply the 8 volumes of vapor without materially changing the compositions of the gasoline. This condition will persist without further change except for the diffusion of gasoline vapor into the main body of the surrounding air. Diffusion is a very slow process, but even a few days of time would result in definite loss of gasoline and in time the whole air volume would contain gasoline vapor, this evaporation being terminated only by the loss of all of the gasoline.

In practice, temperature and (barometric) pressure are never constant, and hence vapor-air mixture is displaced from the open container by expansion. Later upon contraction (lower temperature or higher barometric pressure), air enters the space in the container and becomes saturated with additional gasoline. These cycles of pressure decrease and increase further hasten the evaporation of gasoline.

The same gasoline is held in a spheroidal tank with its release valve set at 2½ lb. gage pressure and intake valve set at 2 oz. of vacuum. A ship is then bunkered from the nearly full tank. Would the motor gasoline offset the vacuum of 2 oz. after a period of time, or would it put the tank up to a pressure of 2½ lb. gage? In other words, will the vapor pressure of the gasoline put a pressure on a partially filled vessel over the atmospheric pressure?—F. X. K.

At the moment withdrawal is stopped the pressure in the tank will be 2 oz. vacuum but the intimacy of contact (and time) required for establishment of an equilibrium or constant state has probably not been provided and hence the pressure would tend to rise. In the extreme, i.e., the air enters without any gasoline evaporating into it, the pressure in the tank (14.7 lb. less 2 oz.) would increase by almost the full 8-lb. vapor pressure of the gasoline as evaporation takes place, resulting in a final pressure of almost 22.7 lb. abs. (8 lb. shown on the gage). In practice, the gasoline evaporates during pumpout almost as fast as air enters and almost any intermediate pressure between the settings of the pressure and vacuum relief valves will be registered.

In answer to the last question, a liquid held in a partially filled (with liquid) container but containing no air, will produce a pressure on the inside of the container that is equal to its vapor pressure, i.e., 8 lb. in this case, 26 lb. for a 26-70 grade natural gasoline or about 2 lb. for a heavy aviation alkylate. This situation is seldom encountered with low (subatmospheric) vapor-pressure products because such materials are stored in tanks that are vented to the air or are equipped with vacuum relief valves. With high (superatmospheric) vapor-pressure products the situation stated here is the common one, i.e., they are stored in pressure tanks which contain no air except at the first filling of the tank.



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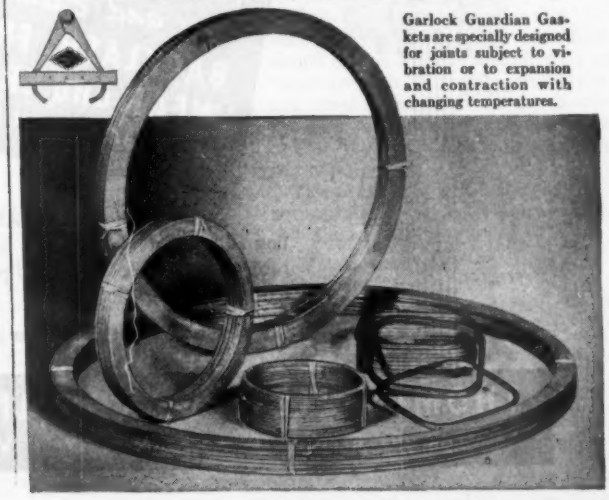

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New Drilling Problems Face Florida Operators

(Continued from page 45)

was encountered but in attempting to ream it to 17½ in. to set 13½-in. casing, difficulty developed. The formation appeared much harder than when drilled and reamers kept breaking off in addition to the pipe twistoffs. One theory advanced was that the water with which the hole was drilled because of loss of returns tended to crystallize the lime so that when later reamed it was much harder than originally. However, it also was considered probable that the trouble may have been due to the much larger hole being reamed. With the 13⅜-in. casing set at 3,900 ft., subsequent hole has been drilled without an excessive amount of difficulty, although additional loss of circulation has occurred. Below the above casing, hole was reduced to 12½ in., and again at 5,500 ft. it was reduced to 8⅝ in. Hole now is drilling below 7,500 ft.

Drilling Without Returns

In the Sunniland area, the cavernous coral limestone is found at depths of from 1,500 to 2,000 ft. continuing below 6,000 ft. This is overlain with porous sands and gravels in which loss of circulation also occurs almost from the surface. In the first well, completed as a small producer at a total depth of 11,626 ft., large sums were spent on mud admixtures and a great deal of time was lost in attempting to regain circulation unsuccessfully before it was decided to drill ahead without returns, using water. Before it was through, one continuous interval of more than 4,000 ft. was drilled with complete loss of returns. This was complicated by the necessity for having to control at one point (2,600 ft.) a heavy flow of water requiring a mud weight of more than 9.4 lb. As the mud column in the annular space above the water flow could not be built up by circulation through the drill pipe, the mud-weighting admixture had to be pumped into the annular space.

Since then a second well, a mile from the first, has been drilled to a depth of approximately 13,000 ft., where it was abandoned, and a third now is drilling. The second also was forced to drill long sections without returns, and successfully negotiated the thick cavernous coral sections. In both wells, numerous additional very porous formations were encountered below the coral formation, but returns were maintained by keeping filtration rate of the mud at minimum with close chemical treatment. Both wells also encountered some very hard formations as well as some heavy pressures.

Casing Program

The present drilling program in these areas calls for setting about 80 ft. of conductor pipe to start the well, and then about 800 ft. of 20-in. surface pipe to protect the upper porous sections. Below this drilling is continued with mud until returns are lost, after which water is used and the hole drilled without returns until it is reasonably sure the bottom is through the cavernous formation. This is expected around 3,500 ft. and, if true, 13⅜-in. casing is run, and hole size reduced. However, if the hole is not through the cavernous portion, drilling is continued without the above casing string to about 6,000 ft., the bottom of the coral bed, where 9⅝-in. casing is set.

Surface conditions in the Sunniland area, also in the Everglades, are somewhat different from those in the previously mentioned Venus area. Heavily vegetated swamps exist in places, requiring the use of matting foundations for rigs and plank roadways into locations. There the operations are carried on much the same as in swamp areas of coastal Louisiana.

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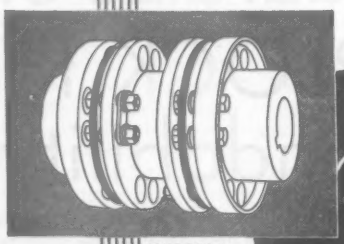

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Application of Permeability and Viscosity Measurements to Oil-Reservoir Studies

THE flow of oil through a sand to a well depends upon the size and shape of the interstices between the sand grains or crevices in the reservoir rock, the thickness of the sand, the viscosity of the oil, the distance which the oil flows to reach the well, the diameter of the well, and the pressure in the reservoir. These factors determine the rate of oil flow and are the most important in oil production. In a reservoir where the oil is flowing radially from all directions toward a well, the rate of flow is calculated by the following formula[1] for viscous flow:

$$Q = \frac{K \cdot 2\pi t (P_1 - P_2)}{\mu \log_e (r_1/r_2)}$$

Q = the rate of flow of the oil in milliliters per second

K = permeability of the sand in darcys

μ = viscosity of the oil in centipoises

t = thickness of the sand in centimeters

r_1 = radius of drainage area of the oil flowing to the well in centimeters or feet and may be considered to be one-half the distance between oil wells in the field

r_2 = the radius of the well in centimeters or feet (it must be the same unit as r_1)

P_1 = the static or closed-in reservoir pressure in atmospheres

P_2 = the bottom-hole pressure in atmospheres when the well is flowing at rate Q

$\log_e$ = in ordinary logarithms, the equation $10^2 = 100$ may be written $2 = \log_{10}100$, and, in general, $10^x = y$ may be written $x = \log_{10}y$. If y is given, its logarithm, x, may be found in ordinary logarithm tables. Then x is said to be a logarithm of the number y to the base 10 and is indicated by the abbreviation "log" and read log or log to the base 10. In natural or Napierian logarithms, 2.7183 is substituted for 10 and is indicated by the abbreviation "$\log_e$" and read logarithm to the base e. Tables are provided so that the natural logarithms of any number can be ascertained quickly. In the above equation, 500/0.3 = 1,666. The $\log_e$ of 1,666 = 7.42. If one does not have a natural logarithm table, the ordinary logarithm of the number may be looked up and then changed to $\log_e$ by multiplying by 2.303. Natural logarithms with the base e are used in calculations like this one involving differentiation and integration.

The following example shows how the formula is applied. Suppose the permeability of an oil sand, K, is 1 darcy; the distance between wells is 1,000 ft.; the drainage area, r_1, then would be 500 ft. The diameter of the hole in the sand is 0.6 ft.; then the radius, r_2, would be 0.3 ft. The reservoir pressure, P_1, is 1,275 p.s.i. or 87 atm.; P_2, the flowing bottom-hole pressure of the well is 1,000 lb. or 68 atm.; the viscosity of the oil, μ, is 1 centipoise; the thickness of the sand, t, is 10 ft. or 306 cm. Substituting these values in the radial flow formula, we have:

$$Q = \frac{1 \times 2 \times 3.1416 \times 306 \times (87 - 68)}{1 \times \log_e 500/0.3}$$

$$= \frac{36{,}530.52}{7.42} = 4{,}923.25$$

or 4.92 liters per second. In order to change liters per second to barrels per hour, multiply by the factor 22.6457, and the answer is 111.3 bbl. per hour—a very good well.

In making flow calculations, the following conversion factors are helpful:

1 atm. = 14.7 lb.
1 ft. = 30.48 cm.
1 liter per second = 22.6457 bbl. per hour.

$\log_e (r_1/r_2)$ = approximately 7.0. More exact factors for this ratio are given in Table 1.

The ratio $\log_e (r_1/r_2)$ or ratio of radius of drainage area to the radius of the hole, only varies from about six to eight through a large range in well diameters and drainage areas. Hence, if one substitutes the average figure, 7, the error will not be too large for ordinary computations.

The practical application of these computations will be discussed in the next installment.

TABLE 1—FACTORS FOR CALCULATING RATIOS OF RADIUS OF WELL TO RADIUS OF DRAINAGE AREA FOR DIFFERENT WELL SIZES AND WELL SPACING

One-half distance between wells in feet	Radius of well in feet	(r_1/r_2)	$\log_e (r_1/r_2)$	Radius of well in feet	(r_1/r_2)	$\log_e (r_1/r_2)$	Radius of well in feet	(r_1/r_2)	$\log_e (r_1/r_2)$
200	0.3	200/0.3	6.50	0.4	200/0.4	6.22	0.5	200/0.5	5.99
300	0.3	300/0.3	6.91	0.4	300/0.4	6.62	0.5	300/0.5	6.40
400	0.3	400/0.3	7.19	0.4	400/0.4	6.91	0.5	400/0.5	6.69
500	0.3	500/0.3	7.42	0.4	500/0.4	7.13	0.5	500/0.5	6.91
600	0.3	600/0.3	7.60	0.4	600/0.4	7.31	0.5	600/0.5	7.09
700	0.3	700/0.3	7.76	0.4	700/0.4	7.47	0.5	700/0.5	7.25
800	0.3	800/0.3	7.89	0.4	800/0.4	7.60	0.5	800/0.5	7.38
900	0.3	900/0.3	8.00	0.4	900/0.4	7.72	0.5	900/0.5	7.50
1000	0.3	1000/0.3	8.11	0.4	1000/0.4	7.83	0.5	1000/0.5	7.60

Reference

1. Wyckoff, R. D., Botset, H. G., Muskat, M., and Reed, D. W., Measurement of Permeability of Porous Media, Am. Assoc. Pet. Geol. Bull., Vol. 18, No. 2, pp. 161-190, 1934.

Series prepared by F. B. Plummer, professor, petroleum engineering school, University of Texas

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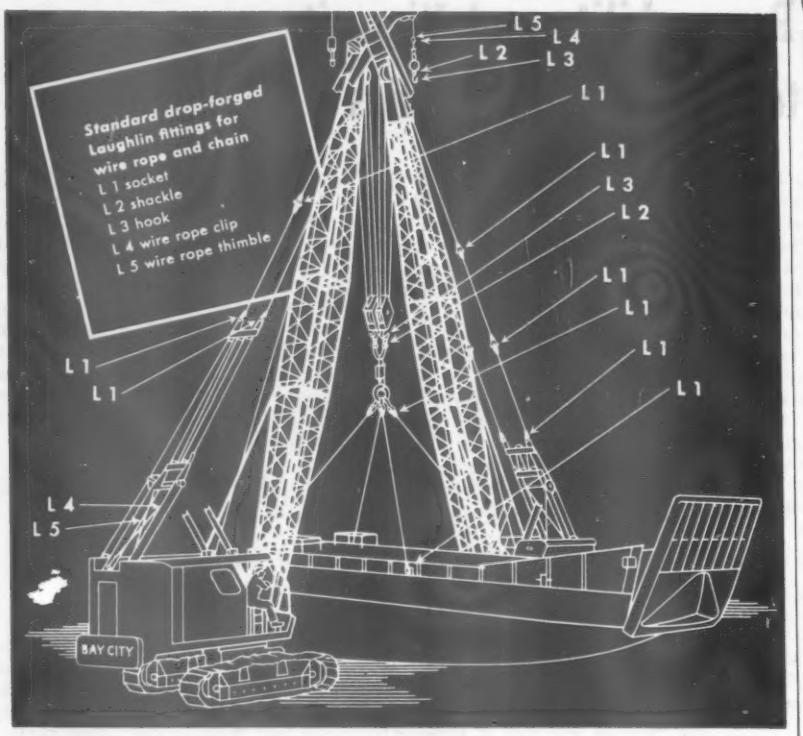

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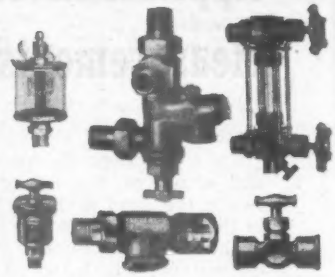

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Straightrun Aviation Gasoline Manufacture

THE topping of crude oil will probably continue to be the cheapest way to produce the low-octane number (73 to 90 A.S.T.M.) aviation gasoline. In order to obtain even such octane numbers when using customary amounts of tetraethyl lead (1 cc. up to 4 cc.) it is necessary to desulfurize the gasolines from many crude oils. Only the distillation part of aviation-gasoline manufacture will be discussed here.

The distillation range and properties of such gasolines are about as follows:

Reid vapor pressure, p.s.i.	6.5-7
10 per cent point, °F.	128-167
50 per cent point, °F.	170-221
90 per cent point, °F.	235-293
Sulfur, per cent	0.005-0.05
Octane No. (A.S.T.M.):	
Clear	63-69
1 cc. TEL	71-83
4 cc. TEL	80-91

in which the high limits are permitted by specifications and the lower limits are what some refiners have found necessary in order to obtain a sufficiently high-octane number. In order to produce such a material it is necessary to stabilize the front end of the gasoline (7 lb. R.v.p.) and to carefully fractionate the high-boiling end to eliminate the low-octane-number hydrocarbons which became numerous at a boiling point of about 300 ° F. (nonane, etc.).

Regular topping systems are not adequate for the job. Almost all possible arrangements of equipment have been used by various refiners but the three main hook-ups are: (1) Gasoline fractionator and gasoline stabilizer. This involves heating the crude oil to 300°-380° F. to vaporize the gasoline. This usually requires the use of a pipe still but some refiners get along with heat exchange alone. The gasoline is fractionated in a 10-20-tray tower using a reflux ratio of 4 to 8. Such a reflux ratio requires either a reboiler or a further heating of the entire crude-oil feed to a temperature of 360° to 480° F. The latter method of producing reflux is preferable from the standpoint of theory. The overhead may be collected in a hot receiver to reduce the vapor pressure but yields are very small if the gasoline is not stabilized (debutanized) in a separate high-pressure (37-75-lb. gage) tower. Such an operation is shown in Fig. 1. (2) Crude stabilization and gasoline fractionation. No diagram of this method is shown because it requires a high feed temperature and because it cannot be easily controlled. (3) Combination stabilizer and fractionator. This involves a single high-pressure (35-75-lb. gage) fractionator of 20-35 plates and equipped with a reboiler. Butanes and gas are removed at the top, gasoline is drawn from the side through a small steam stripper, and the partially topped or flashed crude flows from the bottom as shown in Fig. 2. The reflux ratio required by this system appears to be enormous because so little material is made overhead. Actually a little less actual reflux than that required for Method 1 is required.

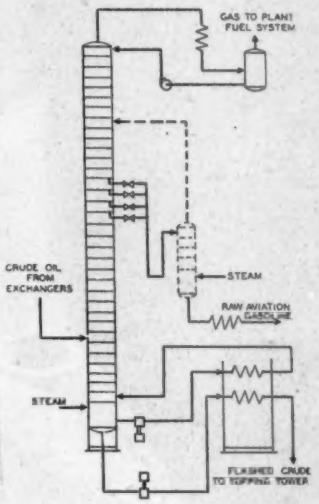


Fig. 2

Any of the methods could be practiced in equipments containing fewer plates of utilizing less reflux than shown in the figures. The conditions suggested here will recover substantially all of the aviation gasoline in the crude oil whereas to halve the number of plates diminishes the yield to about one-third. Although Fig. 2 seems more simple, the single high-pressure tower is both longer and larger than those required by Method 1 (Fig. 1).

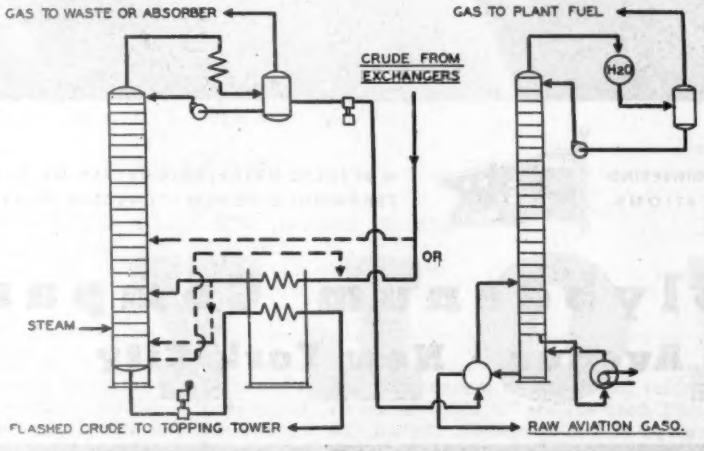
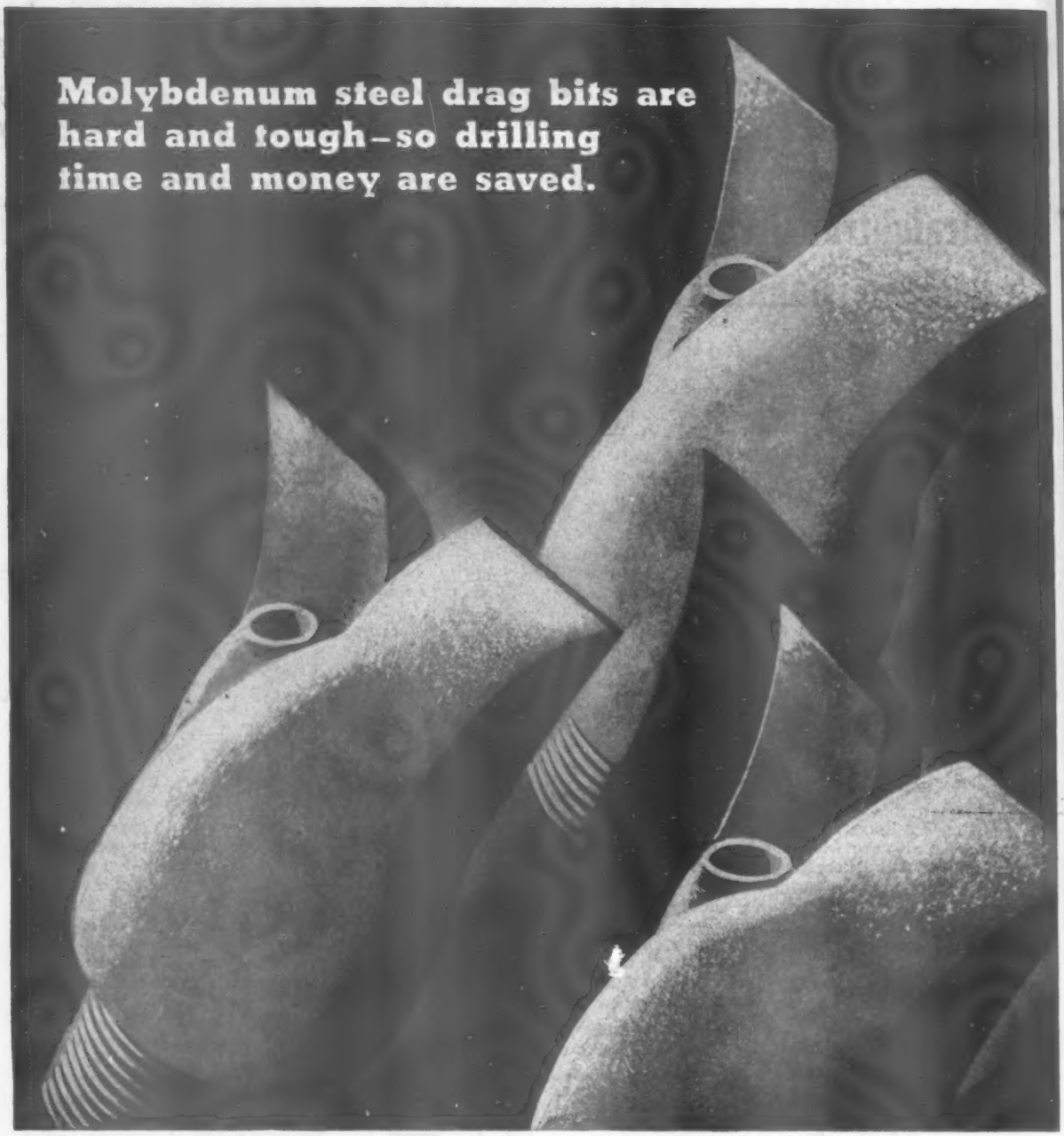


Fig. 1

No. 25 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa



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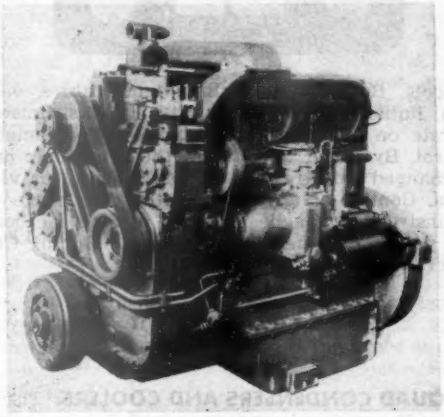
OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

by Kenneth B. Barnes

(1) DUAL VALVE DIESELS. The new Series NH-600 Cummins six-cylinder diesel engines produce one-third more horsepower than the parent H models without appreciably increasing weight or size through (1) increasing maximum operating speed from 1,800 to 2,100 r.p.m.; (2) increasing



displacement from 672 to 743 cu. in.; and (3) employing dual intake valves. In addition, dual exhaust valves permit rapid removal of gases from the firing chambers. The new engines bear marked resemblance to the H line, and a high percentage of parts are interchangeable. First production of the new engines has been installed on 20 and 30-ton dump trucks working on the Iron Range and open-pit mining jobs. Quantity production is anticipated this year, subject to war developments, for automotive and industrial applications. The H (150-hp.), HS (200-hp., supercharged), A (100-hp.) and L (250-hp.) models continue. An illustrated brochure on the NH-600 and NHS-600 additions has just been published and is available. *Cummins Engine Co., Inc., Columbus, Ind.*

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(2) POWDERED ALLOY FOR TIPPING TOOLS. For tipping tools with high-speed steel or tungsten carbide, one copper and two silver-copper alloys, with the required flux mixed in, are now available in powder form. After the piece to be tipped is degreased and ground, the alloy powder is spread on the surface to be joined, the tip placed in position, and the assembly heated until the alloy melts. *Eutectic Welding Alloys Co., New York, N. Y.*

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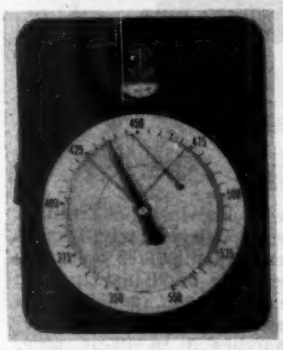

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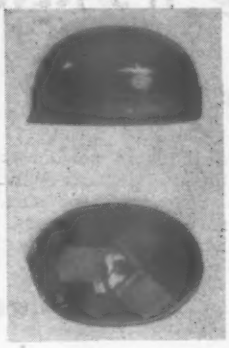
OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

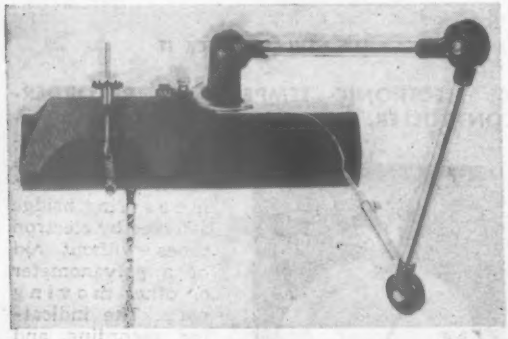
(5) LIGHT WEIGHT HEAD PROTECTORS, known as "Beanie" caps, provide for many industrial jobs a new lightweight (6-oz.) protective covering for the head. Made of molded fiber, they employ a soft, flexible band which fits any shaped head comfortably. The cap lining and hammock are arranged so as to cushion the blow.



Portable Products Corp., Pittsburgh, Pa.

IT'S NEW CHECK IT

(6) LAYOUTS FOR TORCH CUTTING. In torch-cutting pipe or other steel material for bends, angles, and various shapes, the difficulty of laying out the work so that it will fit together properly



for final assembly is well known. The Trumark protractor comes in three models which will scribe angles to ½°. The expense of mistakes on a few jobs brought on by inaccurate hand marking can more than pay for the instrument, which has a builtin spirit level, spring clamping chain, and 180° scale. Model shown handles 3 to 18-in. pipe; another has range 12 to 36-in. diameter; the Junior is for ½-in. to 2-in.; all can be used on flat surfaces and channel, T, I-shapes. *Tru-Line Corp., Los Angeles, Calif.*

IT'S NEW CHECK IT

(7) HEAVY-DUTY GEAROMATIC CATHEAD, which will take the largest sizes of line shafts, now completes a series of models which meet requirements for all classes of modern high-speed drilling rigs. The Junior cathead is for shafts up to 3¼-in., the "E" Senior up to 5-in.; and the "HD" for the largest. All models employ heavy-duty gear units which increase pull and correspondingly reduce speed of the braking sheave. One of the large catheads was used on the recent depth-record breaking K.C.L. 20-13 well in California. *MacClatchie Manufacturing Co., Compton, Calif.*

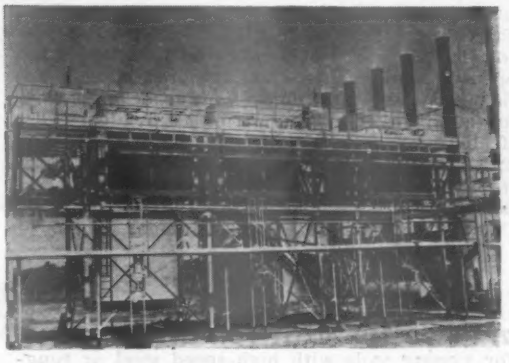
IT'S NEW CHECK IT

(8) AIR-OPERATED CONTROL INSTRUMENTS have the adjusting mechanism arranged so that throttling changes between ½ and 15 per cent may be made by the operator without the need

of tools. Built for controlling temperature, vacuum, liquid level and humidity, the instruments operate on the free-vane principle of automatic control. By finger adjustment the controllers can be changed from reverse to direct acting or vice versa. Control at any value within the range of the instrument can be made by turning the control pointer to the desired value. *Bristol Co., Waterbury, Conn.*

IT'S NEW CHECK IT

(9) QUAD CONDENSERS AND COOLERS. Three Young-Happy Quad condensers installed in a midwestern petroleum-refinery unit engaged in the production of isobutane and butane are shown in the photograph. These are Model 125 Quads which utilize 22 fan. hp. at 204 r.p.m. and deliver 116,000



cu. ft. per minute of cooling air. Fan units in the photograph are driven by multicylinder gas engines; however, electrically motorized drives can be used on the units with equal facility. In the same refinery installation six Quad coolers are used to reduce the temperature of the jacket water and lubricating oil from eight 600-hp. angle compressors and driving engines.

Quad condensers and coolers employ 10-ft. fans, fitted in the top duct of the assembly in a horizontal plane. A feature of the Quads is that additional cooling or condensing capacities can be

made by installing cores on the blank side of the frames. *Young Radiator Co., Racine, Wis., and The Happy Co., Tulsa, Okla.*

IT'S NEW CHECK IT

TRADE LITERATURE

(10) SOCKETING WIRE ROPE, a comprehensive handbook on proper way to prepare the rope and to pour molten zinc. Fully illustrated, and designed to assist in correcting one of the greatest causes of wire-rope trouble, improper socketing. *Union Wire Rope Corp.*

IT'S NEW CHECK IT

(11) TRUSS-TYPE BUBBLE TRAYS, a booklet profusely illustrated with three dimensional drawings showing how bubble trays and caps are designed to meet various process demands, vessel designs, corrosive and thermal conditions, installation problems, and inspection and maintenance problems. *Fritz W. Glitsch & Sons.*

IT'S NEW CHECK IT

(12) INERT GAS GENERATOR, a technical booklet describing how inert gas generator units provide especially designed equipment and controls to meet specific production problems of inert gas from combustion of gas or liquid fuels. Further describes the many uses for inert gases in petroleum, chemical and allied industries. *Davison Chemical Corp.*

IT'S NEW CHECK IT

(13) GENERAL SERVICE VALVE, plus a new type bonnet which is self-sealing and requires no flanges, no bolts or no glands. A full-steel bronze mounted gate valve. The Through Conduit permits a round full-bore opening entirely through the valve. Made in 1,000-lb. and 1,600-lb. test pressure sizes. *W-K-M Co., Inc.*

IT'S NEW CHECK IT

(14) METALLIC PACKING for piston rods of all engines and compressors. A 40-page, highly illustrated, reference book on this subject. Contains many basic engineering data, together with practical guidance in the application and maintenance of metallic packing. *C. Lee Cook Manufacturing Co., Inc.*

IT'S NEW CHECK IT

(15) THE LITTLE HAND BOOK, a buyer's guide for stampings and tank heads. Describes in detail the facts needed in considering purchase of steel shapes or oval and elliptical tank heads, obround heads, and others. *The Commercial Shearing & Stamping Co.*

IT'S NEW CHECK IT

OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

(16) PLASTIC COATING, a new folder describing the properties, uses and benefits of plastic cold-applied, protective coating. Contains many factual data on elimination of corrosion. *Amercoat Division, American Pipe & Construction Co.*

IT'S NEW CHECK IT

(17) SEPARATING SUSPENDED SOLIDS, a new bulletin, very effectively illustrated, on the application of centrifugal separators. *Merco Centrifugal Co.*

IT'S NEW CHECK IT

(18) CAST STEELS. A four-page reference chart (revised edition) on carbon and low-alloy structural cast steels. Lists nominal analysis and minimum physical properties. *Lebanon Steel Foundry.*

IT'S NEW CHECK IT

(19) ALLOY STEEL CASTINGS. A four-page reference chart (revised edition) on corrosion and heat-resisting alloy steels. Lists principal alloying elements and typical physical properties. *Lebanon Steel Foundry.*

IT'S NEW CHECK IT

(20) KRANE KAR, a mobile swing boom crane, described in 24-page booklet highly illustrated with photographs and diagrams. Includes factual, concise specifications, for the practical applications in loading, unloading and transporting materials, from 1 to 10 tons, under the most difficult conditions. *Silent Hoist Winch & Crane Co.*

IT'S NEW CHECK IT

(21) CLEAN OIL, an attractive 10-page 2-color booklet giving special emphasis to outstanding engineering and installation developments in the field of oil purification. With exact engineering and scientific discussions of specific problems. *Honan-Crane Corp.*

IT'S NEW CHECK IT

(22) CORROSION, a 54-page book containing convenient and comprehensive analysis of corrosion principles for both the practical man and the technician. Explains how corrosion processes begin, how they progress, and the steps being taken to retard or prevent such destructive action. *The International Nickel Co.*

IT'S NEW CHECK IT

(23) SUPERCHARGING, an extensive review of the phenomenal advancements made in superchargers on aircraft engines as might apply to

power units for all industry after the war. *B-W Supercharger, Inc.*

IT'S NEW ✓ CHECK IT

(24) FILTERS FOR REFINERIES, a profusely illustrated 12-page book on functions of filtration and clarification in the refining of petroleum. Filter applications are discussed in detail. *Oliver United Filters, Inc.*

IT'S NEW ✓ CHECK IT

(25) TIME TEMPERATURE DISTRICT GAS REGULATORS, a book detailed in its description of application and operation of this type control equipment, fully illustrated with drawings and installation photographs. *Fisher Governor Co.*

IT'S NEW ✓ CHECK IT

(26) FLOW RATIO CONTROLLER designed for use where it is desirable to have two liquid or gas flows automatically proportioned at any desired ratio. This ratio may be varied at will by a turn of a button, and readily maintained at any point from 1/5 to 1 up to as high as 5 to 1. Liquid flows from 1 g.p.m. up to 6,000 g.p.m. may be proportioned, and gas flows in equivalent volumes. Positive in action and simple in operation. The full and interesting details in regard to this new Rotamatic ratio controller are available in booklet form. *Fischer & Porter Co.*

IT'S NEW ✓ CHECK IT

(27) SPARK PLUGS, a detailed pamphlet giving specification charts on recommended sizes, and gap setting for various installations. Plugs for heavy-duty gas-engine service are also featured. *Stitt Ignition Co.*

IT'S NEW ✓ CHECK IT

(28) FIRE EXTINGUISHING EQUIPMENT, a catalog of hand portable and wheeled dry chemical extinguishers, with charts and other useful data on this subject. *Dugas Division, Ansul Chemical Co.*

IT'S NEW ✓ CHECK IT

(29) MICRO SWITCHES, a 100-page catalog, well illustrated, describing over 500 heavy-duty-type Micro switches and auxiliary devices for electrical controls. *Micro Switch Division.*

IT'S NEW ✓ CHECK IT

(30) DURONZE MANUAL, revised edition of 80-page book, containing specifications and technical data on five outstanding copper-base engineering alloys. Many examples of product improvement through use of high-strength, corrosion-resistant alloy, are discussed. *Bridgeport Brass Co.*

IT'S NEW ✓ CHECK IT

(31) BAND-IT CLAMP, formed from continuous roll of Band-It metal band. Convenient for either shop or field use. Useful on all sizes of hose or pipe connections. Comes in four widths of bands and buckles. *Band-It Co.*

IT'S NEW ✓ CHECK IT

(32) INSTRUMENTATION, a bimonthly publication covering all phases of installation and operation of indicating, recording and controlling instruments. *Brown Instrument Co.*

IT'S NEW ✓ CHECK IT

(33) WATER STUDIES, a collection of articles on control of corrosion, scale and algae, together with report on studies on water problems in atmospheric cooling systems. Discussions of steam and return system corrosion, glucosates, and proportioning problems are also contained in this 52-page booklet. *D. W. Haering & Co., Inc.*

IT'S NEW ✓ CHECK IT

(34) INSULATING FIRE BRICK, a new booklet describing five types of fire brick for temperatures up to 2600° F., featuring new data on suspended arches and walls and tailor-made arches and domes. *Armstrong Cork Co.*

IT'S NEW ✓ CHECK IT

(35) WAR EMERGENCY PIPE LINES, a pictorial review of pumps, motors, metal-clad switchgear, oil circuit breakers, transformers and one-man gate valves operating on this important pipe line. *Allis-Chalmers Manufacturing Co.*

IT'S NEW ✓ CHECK IT

(36) VERTICAL MULTISTAGE PUMP, designed for handling liquids, hot or cold, corrosive or non-corrosive, where the net positive suction head is limited. Described in new bulletin just released, illustrated and containing useful operating data. *Byron Jackson Co.*

IT'S NEW ✓ CHECK IT

(37) WATER DEAERATION, reprint describing the application and general design of cold water deaerators to prevent corrosion of pipe lines, heat exchange equipment, etc. *Cochrane Corp.*

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Twenty-five years ago we set forth to serve a thriving industry. Through the continued faith of our many friends, we have grown and prospered.

At the end of this important mile post in our career, we would like to say to our many loyal friends and customers—"Thank you!"

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Natural Gas

Panhandle Eastern to Sell Gas in Canada

CHATHAM, Ont. — Following negotiations in progress for more than a year an agreement has been reached between Union Gas Co. of Canada, Ltd., and the Panhandle Eastern Pipe Line, for a supply of natural gas from Texas for the system now served by the Union company in southwestern Ontario. The agreement is conditional upon approval by the United States authorities and an upward revision of the revenues now received by the Union company and its subsidiaries. The project contemplates the importation in off-peak periods of approximately 5,000,000,000 cu. ft. of natural gas per year.

Purchases under the new agreement will be delivered in varying quantities through 8 months of the year, the gas being stored in old wells in the Dawn field for delivery to consumers as needed. The field has already been used for storage of refinery gas from the Imperial Oil, Ltd. plant at Sarnia, which now forms part of the Union company's supply.

The project will involve capital expenditures by the Union company of about $3,000,000. Necessary construction will involve some 70 miles of transmission lines, including a line under the Detroit River, and compressor plants to pump the gas to the Dawn field, and into the reservoir. Gas deliveries will be made from April to November, inclusive, when the Panhandle Eastern lines are not fully occupied in supplying United States demands.

Commission Amends Basic Order for Hugoton Field

OKLAHOMA CITY. — The State Corporation Commission last week issued an amended basic order affecting drilling and production of wells in the Guymon sector of the three-state Hugoton natural-gas field. The order, effective January 1, replaces the original one issued in May 1943 and is similar to the basic order issued by the Kansas Corporation Commission, with a view of setting up uniform regulations for the vast gas reserve.

One amendment permits communitization of leases in adjoining sections upon application to the commission. The original order provided for unitization by government survey sections. Only one well in any 640-acre unit is permitted, and allowable production is based on such a unit.

The formula for making deliverability tests on wells has been changed, but the revision will not cause taking of new potentials on present producers.

The Hugoton reserve extends into seven counties of southwestern Kansas; through most of Texas County, Oklahoma, and parts of Hansford and Sherman counties, in the Texas Panhandle area. Texas Railroad Commission has not yet joined the Oklahoma and Kansas commissions in a uniform order for the field.

Only 2 Per Cent of Gas Is Wasted, Says Thompson

AUSTIN.—Of all natural gas produced in Texas, only about 2 per cent is wasted, Col. E. O. Thompson, of the State Railroad Commission, said last week, basing his statement on data concerning production and consumption provided, at the request of the commission, by producers and processors. The commission is engaged in a study of gas conservation. Waste, Thompson said, decreased from 37 per cent of production in 1935 to 4.3 per cent in May 1944, and it has fallen still further since then.

The figures on output and utilization revealed the following distribution: Light and fuel, including gas transported by pipe line to Denver, Indianapolis, Chicago, St. Paul, Kansas City, Detroit and points in New Mexico, Tennessee and West Virginia, 36 per cent; extraction loss in natural-gasoline plants, 4 per cent; fuel in such plants, 10 per cent; repressuring of fields and recycling, 28 per cent; used in lifting crude oil by putting back in the oil fields, 4 per cent; manufacture of carbon black, 16 per cent; waste, 2 per cent.

"Most of the gas wasted comes out of wells producing oil," Thompson added. "The gas is produced coincidentally with oil production. It lifts the oil to the earth's surface in many cases. If no one buys this gas it is released into the air and burned in a flare for safety's sake. If it were not burned the gas would settle in low places and might be set off by a match or a spark.

"When the uninformed see these flares burning near oil wells they are likely to remark how much they would like to have that gas to burn in a stove at home. But if you told them you would give it to them if they would pipe it away they would find it too costly to come and get."

Helium Sales at High Level Owing to Industrial Use

WASHINGTON. — New industrial uses for helium, chiefly in the welding of magnesium and its alloys and now extensively utilized in the aircraft industry, increased sales of this noninflammable gas to commercial distributors in the United States to more than 250,000,000 cu. ft. monthly during 1944, the Bureau of Mines reports. Helium also is being sent to other private industries working on Army and Navy contracts, but this is included in confidential military distribution figures.

In less than 2 years the monthly average diverted to commercial distributors has increased from about 88,000 cu. ft. in 1942 to the present average of about 250,000 cu. ft. Bureau officials say even greater quantities of helium are available for industrial and medical uses.

Although the bureau controls the entire production of helium, marketing of gas, other than that consigned to the Army, the Navy, and the Weather Bureau, is handled by commercial distributors of compressed gases who maintain stocks of helium in cylinders in principal cities of the country.

Butane and Propane-Butane Stocks Tight, Says PAW

WASHINGTON. — Stocks of butane and propane-butane mixtures for civilians are at low levels, Petroleum Administration for War has informed dealers in the South and Southwest, and only such supplies as already have been assigned for delivery to consumers can be released. PAW cautioned that consumption should be limited to minimum essential requirements.

Stocks are particularly tight in Alabama, Mississippi, Georgia, Florida, Louisiana, Texas, Arkansas and Oklahoma. PAW reported that every effort is being made to distribute available supplies equitably, but said the task requires wholehearted cooperation of the public.

In addition to its use in the manufacture of 100-octane gasoline, butane is used as fuel in industrial plants making small ammunition.

REFINING

Bolivia Takes Initial Steps In Oil-Refinery Program

Bolivian State Oilfields has entered into a contract with a refinery-equipment concern in the United States for preliminary studies looking to the construction of one or more refineries in Bolivia. Funds for the project are to be borrowed from Bolivian Development Corp.

The study will be comprehensive, including favorable sites, water supply, available electric power, plant capacity, strategic position, quality of the crude-oil supply, marketing of byproducts, etc.

France Needs Oil Products And Refinery Equipment

France is in great need of equipment for restoration of its own refining industry, according to the European press. About 50,000,000 bbl. of petroleum products were consumed annually in that country before the war, with Iraq as the principal source of supply. The French refining industry in 1939 had a daily crude-oil capacity of 150,000 bbl.

Plants along the Mediterranean are believed to have suffered little war damage, but, with the possible exception of those in the Gironde region, all others have been destroyed or made worthless until repairs can be made. The oil industry is largely under control of the Government, so it is assumed that rehabilitation work will begin as soon as equipment and materials can be obtained.

France's direct participation in oil production lies mainly in Iraq where the Government-sponsored Compagnie Francaise des Petroles has a one-quarter interest in Iraq Petroleum Co.

OIL and GAS
BURNING EQUIPMENT

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Gulf Coast Gasoline Stocks Register Moderate Rise

HOUSTON.—Stocks of all grades of gasoline and naphthas at plants in Gulf Coast Refiners Association registered a moderate rise in the first half of December, totaling 1,578,183 bbl., an increase of 3,690. A year ago the same plants had gasoline inventories aggregating 1,456,614 bbl. Two years ago they were 2,081,457 bbl., or 503,274 more than the current figure.

Automotive gasoline stocks considered alone were 509,671 bbl. on December 15, a decrease since November 30 of 177,494 bbl. and only 45 per cent of the 1,120,167 bbl. reported on December 15, 1942. Refiners point out that further improvement in gasoline stocks is needed to restore them to proper working levels.

Total stocks of all products of the association group were reported at 4,196,110 bbl. December 15, an increase of 173,054 during the first half of the month. A year ago total products stocks were 3,545,184 bbl. Stocks of all products 2 years ago were 5,419,558 bbl., then considered about normal.

Crude-oil runs to stills totaled 119,124 bbl. daily, maintaining the high levels reported during the past few months. Crude runs were 82.2 per cent of present rated operating capacity and represent an increase of 20,257 bbl. daily in comparison with operations at 81.3 per cent of capacity a year ago, when the group processed 98,867 bbl. a day. Two years ago crude runs were 94,279 bbl. a day.

Japs Say They're Making Gasoline From Pine Sap

WASHINGTON. — Aviation gasoline equal to that produced from petroleum, if not better, is being made by the Japanese from the sap of pine-tree roots, according to a Tokio broadcast of Domei News Agency.

"The picturesque Japanese pine, indispensable in every Japanese garden, has at last joined the ranks

You're "Safe"
WHEN YOU CARRY
90-UL
ECOLITE

Don't Wait—Get this new Safety Lantern with BROKEN BULB EJECTOR!

SAFE
IN HAZARDOUS PLACES

Tested and Recommended by Underwriters' Laboratories.

- Sealed beam construction.
- Throws bright beam 1500 ft.

Ecolite No. 90-UL

- Large handle and pivoting feature gives you light where you need it and both hands free for work. Now at jobber and supply stores.

ECONOMY ELECTRIC LANTERN COMPANY
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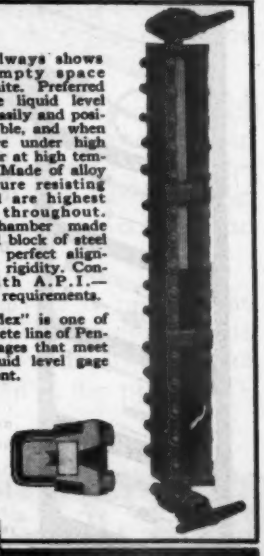
"REFLEX"
DROP FORGED STEEL
LIQUID LEVEL GAGES

Liquid always shows black—empty space shows white. Preferred where the liquid level must be easily and positively visible, and when liquids are under high pressure or at high temperature. Made of alloy temperature resisting steel and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Reflex" is one of the complete line of Penberthy Gages that meet every liquid level gage requirement.



PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

as a valuable munitions raw material," Domei said in the broadcast heard by the Federal Communications Commission.

Reporting an "official disclosure," the news agency said the new synthetic gasoline was under production through a "simple patented process, and already is being mass-produced on an industrial scale."

American refiners say the possibilities of making gasoline from pine sap have been recognized, but that they are too limited to stir much interest. Sap of the Jeffery pine contains a large percentage of normal heptane, which has a zero octane number. Also turpentine from pine sap can be hydrogenated to hydrocarbons fairly suitable for motor fuel. It is pointed out that the number of pine trees in Japan and Japanese-occupied areas is too small to afford an impressive volume of synthetic gasoline.

C. W. Barbour Now Heads Allied Materials Corp.

OKLAHOMA CITY.—C. W. Barbour, formerly executive vice president of Allied Materials Corp., in charge of operations, has been made president in the process of a reorganization attending the resignation of T. A. Nicholson as president and the acquisition of his interest by the company. Bert Brooks succeeds Barbour as vice president. Nicholson recently was placed on inactive duty from the Navy, with the rank of commander.

The company, organized 12 years ago, has a refinery at Stroud, Okla. It is credited with being the largest refining concern devoting major attention to the manufacture of asphaltic products from crude oil.

Sketches of Plant Operators

BASIL HOPPER, long identified with the manufacturing department of Union Oil Co. of California, was elected vice president of the company last month. He first became affiliated with the company June 18, 1923, and has served in the company's research and development departments as well as in manufacturing operations at the company's three refineries, Wilmington, Oleum and Malta.

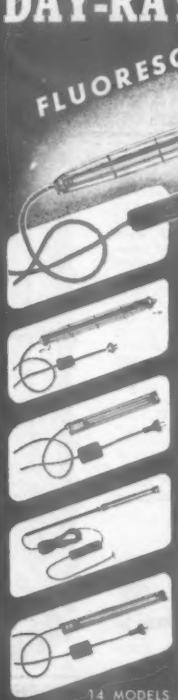
At the time of his elevation to the vice presidency, Hopper was manager of manufacturing with offices at the headquarters in Los Angeles.

Born October 6, 1901, near Neosho, Mo., he came to Los Angeles with his parents in 1904 and received his primary education in Glendora. He later studied chemical engineering at the University of California in Berkeley and graduated from California Institute of Technology in 1923.

As vice president in charge of manufacturing, Hopper will report to W. L. Stewart, Jr., executive vice president.

DAY-RAY

FLUORESCENT LIGHTS



BRING DAYLIGHT TO YOUR JOB

New in design, for use in confined areas, these ultra modern units provide high levels of illumination. Enclosed in a steel guard, equipped with adjustable light shield DAY-RAY brings daylight safely, efficiently to your job.

DAY-RAY is *Efficient*

. . . Spherical lighting. Eliminates shadows. Three to four times as much light from the same wattage as ordinary lamps. Operates at low temperature.

DAY-RAY is *Rugged*

. . . Constructed to withstand shocks and vibrations, yet light in weight and small in diameter.

DAY-RAY lights are manufactured in 14 additional models — steel guard intra-area, plastic tube and moisture resistant types. Write for complete 16-page catalog.

14 MODELS

DAY-RAY PRODUCTS, Inc.

SOUTH PASADENA . . CALIFORNIA

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ACETYL PEROXIDE

May be the Catalyst you have been looking for!

1 High Polymerizing activity

2 Crystal clear liquid

3 High monomer solubility

4 Insensitive to shock

Acetyl Peroxide
PROPERTIES

1 Acetyl peroxide content 20% by weight

2 4% active oxygen by weight

3 Specific gravity 1.18

4 Flash point 45° C. (open cup method)

5 Soluble in common organic solvents and monomers

Available in laboratory samples. Write to:

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A Familiar Face in a New Frame!

ORBIT VALVES

On January 1, 1945, the Oil Well Improvements Company changed its name to Orbit Valve Company.

Since 1912, the Oil Well Improvements Company has been actively engaged in the manufacture of equipment for the petroleum industry that has been distinctive in design and performance and original in conception.

Orbit Valve Company is a new name for an old company. The management, products and policies will remain the same as they have been in the past.

ORBIT VALVE COMPANY
TULSA, OKLAHOMA

"CLEVELANDS"
Forerunners of All Full Crawler Ditchers
ASSURE MAXIMUM RETURN ON YOUR INVESTMENT

From every angle—power, speed, durability—ease of handling and portability—"CLEVELANDS" have proven themselves, on the job, performers of a superior type.

THE CLEVELAND TRENCHER COMPANY
"Pioneer of the Small Trencher"
20100 ST. CLAIR AVENUE CLEVELAND 17, OHIO

PIPE LINES

Iraq Project Discussed As Postwar Possibility

The construction of additional facilities for Iraq Petroleum Co., Ltd., will not be possible until after the war. Plans are under consideration, according to reports, for a postwar construction program which will involve the laying of 24-in. pipe from the Kirkuk field to the junction near the Euphrates River, and 20-in. pipe along branches from the junction to Haifa and Tripoli.

Texas Co. Completes Elk Hills Outlet

The 58½-mile 10-in. crude-oil line of The Texas Co. from the Elk Hills field to a connection with Valley Pipe Line at Cottonwood, Calif., has been completed. L. F. Scherer, assistant chief engineer, Texas Pipe Line Co., who has been supervising the project, is continuing to stay in California during early stages of operation before returning to Houston.

Construction to Start On 79-Mile Line for Dow

Construction contract for a 79-mile 4-in. liquefied petroleum gas line for Dow Chemical Co. from Humble Oil & Refining Co.'s Katy cycling plant to the Dow plant at Freeport, Tex., has been awarded Anderson Brothers.

Contractor is moving equipment from Tunica, Miss., which had been taken there for laying loops for Memphis Natural Gas Co. The Memphis looping job is reported to have been temporarily shut down by an order signed by three judges of the U.S. Fifth Circuit Court of Appeals.

The Dow program calls for starting construction on the Katy-Free-

Cut & Bevel Any Pipe
With
Maximum SPEED
Minimum COST

The H & M PIPE CUTTING and BEVELING MACHINE

SPEED: Complete cut and bevel can be made on 12 inch pipe in about 2 minutes.
ECONOMY: Save approximately one-half labor and gas costs.
PORTABILITY: Can easily be carried from one pipe section to another.

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The H & M
Pipe Beveling Machine Co.
20 East 25th - - Tulsa, Oklahoma

PIPE-LINE PERSONALITIES

GILBERT A. MANUAL, in charge of Williams Brothers Corp. operations in the Houston district, was born December 11, 1905, Noble County, Oklahoma; went to high school at Woodward and studied 3 years in the School of Commerce, Oklahoma A. & M. College.

He started in pipe-line work in June 1927 as a timekeeper for Booth & Flynn Corp. during construction of the Cities Service Gas Co.'s 20-in. transmission system from Pampa, Tex., to Wichita, Kans. Two years later he began his career with Williams Brothers as a timekeeper at Pine Bluff, Ark. For the next 6 years he worked for the company as timekeeper, accountant and field-office manager on pipe-line construction projects contracted by the company.

From 1935 to 1943 he was field superintendent. During the construction of the 24-in. crude-oil line and the 20-in. refined products line for War Emergency Pipelines, Inc., he was in charge of the Cincinnati office of Williams Brothers which handled affairs concerned with operation of the company's spreads and crews engaged in the building of pump stations. He has been engaged in pipe-line construction in 26 states.

On August 19, 1940, he married Virginia Lundy. They have three boys: Jim, 3½ years old; Bob, 2 years, and Van, 9 months.

purt line in the latter part of this month.

Anderson Brothers Moves Headquarters to Houston

On December 30 Anderson Brothers moved its headquarters office from Tulsa to 707 North Drennan St., Houston, where the firm has facilities for offices, warehouse and shops for use in connection with pipe-line contracting operations.

The firm will maintain a Tulsa office at 828 McBirney Building. managed by A. G. Coates.

Cities Service Line Is Half Completed

The 44-mile 16-in. line being laid for Cities Service Gas Co. is nearly half completed, contracted by Sharman & Allen which operates from a field office at Pawhuska, Okla., under Earl Norris, spread superintendent.

Sharman & Allen has completed 10 miles of 6-in. for Gulf Refining Co. near El Dorado, Ark., as part of a project for which 17 miles of 6-in. and 8-in. had been previously completed. For Gulf this firm is completing 10 miles of 8-in. at Waskom, Tex.

C. S. FOREMAN COMPANY

General Contractors

PIPE LINES

20 West Ninth Street
Kansas City, Missouri

SYNCHRO-START

HAVE YOU A MANPOWER PROBLEM?

Automatically Controlled Internal Combustion Engines in the field and at pumping and booster stations will lick a lot of your problems, including that of manpower. Ask your Engine Manufacturer or write us for complete information.

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AUTOMATIC ENGINE CONTROLS

American Light Plans For Financing Line

American Light & Traction Co. has filed an amendment to the proposal presented to Securities and Exchange Commission for the construction of a $70,000,000 pipe line from the Hugoton field to Milwaukee and Michigan by a company which may be called Michigan Wisconsin Natural Gas Pipe Line Co. Under the amendment the proposed company would be organized under the laws of Delaware with the expectation that the American Light company would acquire for $5,000 the new company's initial capital, represented by 50 shares of $100 par value capital stock.

Organization of the company is a major step in the liquidation of American Light under a plan filed by its parent, United Light & Power Co.

The amended petition said the major part of American Light's investment in Detroit Edison Co.'s common stock would be used to finance the pipe line and that ultimately all of the capital stock of Milwaukee Gas Light Co. and Madison Gas & Electric Co., American Light subsidiaries presently serving the area through which the pipe line would extend, would also be used for the same purpose.

The amendment was filed just before a hearing on initial steps in the liquidation of American Light.

James Lee, assistant corporation counsel for Detroit; Charles W. Babcock, first assistant city attorney of Milwaukee, and Howard Hansen, city attorney for Madison, represented their cities' interests in the proposed transactions. They were granted limited participation in the proceedings.

Donald Richberg, counsel for United Light, said the company preferred to restrict the hearing to consideration of the redemption of the 536,324 shares of 6 per cent cumulative preferred stock at par value, plus dividends.

Allied Chemical & Dye Corp., holder of 43.8 per cent of preferred stock of American Light and 4.3 per cent of its common stock, filed an objection to the dissolution and the proposal to retire the preferred at its $25 par value.

"Whatever complexities in corporate structure exist in the American Light system are certainly not so great an insoluble that a death sentence is called for, entailing such substantial sacrifice on the part of investors," Allied Chemical said. It termed the plan unfair and inequitable to the security holders of American Light.

Under the liquidation plan American Light would distribute remaining assets to common stockholders.

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LUBRICATORS
A modern lubricator for modern service on Diesel, gas, steam engines and compressors. Supplies dependable cylinder lubrication in metered quantities reducing friction and wear. Capacities 2 to 24 pt and 1 to 16 feeds. New catalog on request.
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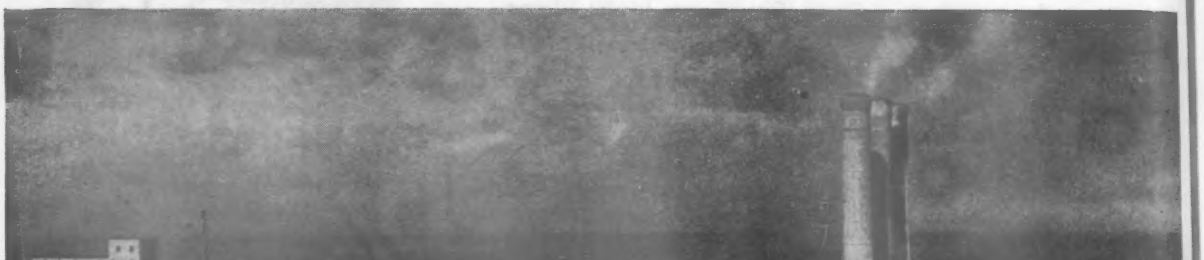
DROP FORGED STEEL
LIQUID LEVEL GAGES

Steel construction throughout with stainless steel interior trim. Automatic shut-off is positive and instantaneous; stainless steel balls shut off the flow of liquid when glass breaks. Heavy duty stuffing boxes, union connections, offset construction facilitate cleaning and simplify glass replacement. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

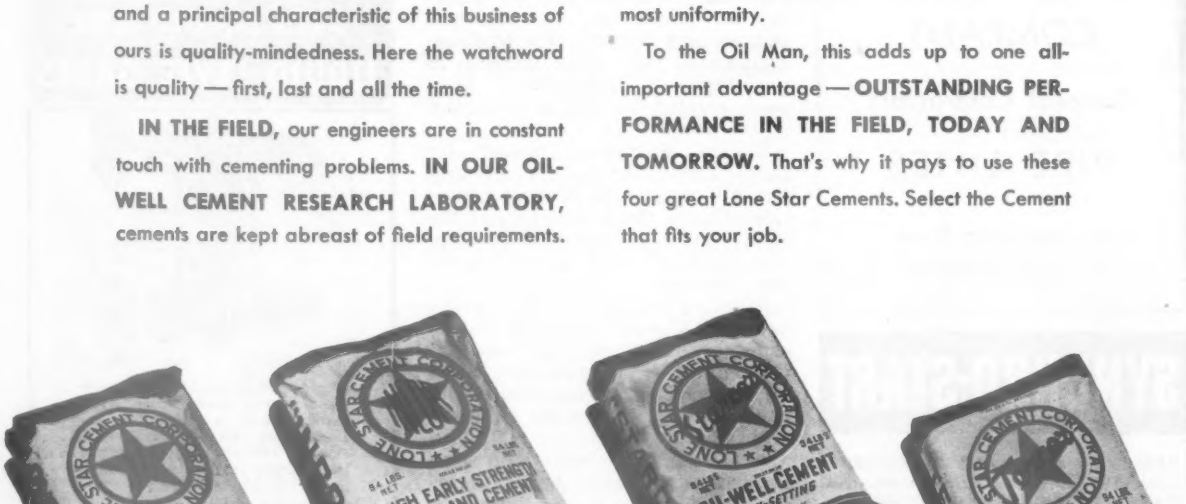


THE WATCHWORD IS QUALITY

A BUSINESS, like an individual, has a personality with its own special characteristics . . . and a principal characteristic of this business of ours is quality-mindedness. Here the watchword is quality — first, last and all the time.

IN THE FIELD, our engineers are in constant touch with cementing problems. **IN OUR OIL-WELL CEMENT RESEARCH LABORATORY,** cements are kept abreast of field requirements. **IN THE MILL ITSELF,** rigid quality control at every stage of manufacture assures utmost uniformity.

To the Oil Man, this adds up to one all-important advantage — **OUTSTANDING PERFORMANCE IN THE FIELD, TODAY AND TOMORROW.** That's why it pays to use these four great Lone Star Cements. Select the Cement that fits your job.



LONE STAR CEMENT CORPORATION • DALLAS • HOUSTON

Week's Highlights

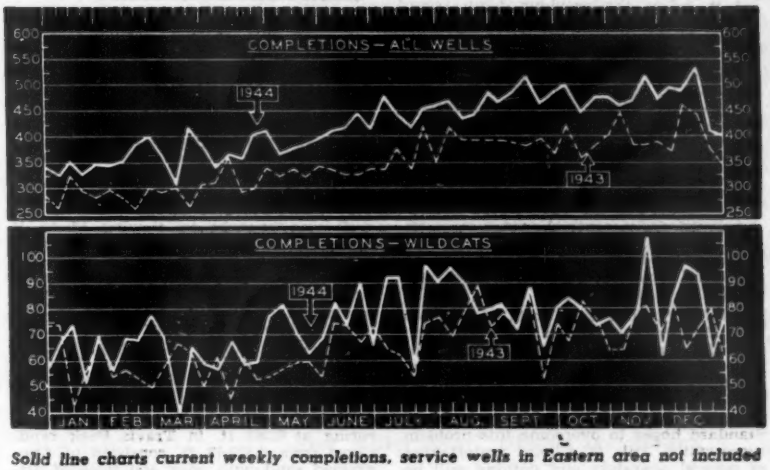
ALMOST unnoticed, outside the Rocky Mountain region, Colorado has been quietly developing what looks like the biggest strike that state has ever had, and moreover, one that because of the regional geology and its geographic location, may well result in future successful exploration efforts that will add Utah to the list of states that produce substantial quanties of oil.

The Rangely field, in Rio Blanco County in northwestern Colorado, about 15 miles east of the Utah line, is on the well-known Rangely anticline. This structure has been mapped on the surface for a length of 12 miles and a width of about 6 miles, with 1,200 ft. of closure. It lies in the Uinta geological basin, which covers a substantial area of northeastern Utah and northwestern Colorado.

Oil was first found on the Rangely structure in 1919 in the Mancos shale of Cretaceous age. Later large gas wells were found in the Dakota sand at about 3,000 ft. In 1933 the California Co. et al drilled 1 Raven in 30-2n-102w and found oil in various zones in the Weber sand of Pennsylvanian age between 5,570 and 6,315 ft., drilled the well to a total depth of 7,173 ft. and shut it in. Last year the well was reopened and the Weber sand shot twice with a total of 1,850 quarts of nitro, after which the well was put on production, choked to about 200 bbl. daily.

In 1944, development was rather quiet until recently, but two more good wells were completed. Now The California Co. 1 McLaughlin-Government, SE NW 24-2n-103w, 1¾ miles northwest of the discovery, has just been completed as the best well to date. Top of the Weber was 5,960 ft., and the well was drilled to 6,500 ft., casing set on top of the sand. On test, the well flowed 344 bbl. of about 35°-gravity oil in 23 hours through a ¼-in. tubing choke, with 325-lb. back pressure on the tubing.

Operators consider 5,000 to 6,000 acres proven and recovery estimates are running as high as 15,000 bbl. per acre. This would mean 75 million to 90 million barrels ultimate recovery.



Solid line charts current weekly completions, service wells in Eastern area not included

COMPLETIONS IN ALL FIELDS . . .

Week ended December 30, 1944

	Oil	Gas	Dry	Total	Footage	Total Comp. to date 1944	1943
N. Y., Penna., W. Va.	52	14	*64	130	156,320	6,362	3,463
Ohio	3	6	7	16	46,608	1,018	980
Indiana	1	0	3	4	7,482	250	229
Kentucky	7	3	2	12	26,591	758	476
Illinois	10	0	10	20	57,818	1,970	1,804
Michigan	4	0	6	10	25,263	681	643
Kansas	10	5	13	28	89,899	1,832	1,715
Nebraska, Missouri, Iowa	0	0	0	0	0	41	46
Oklahoma	11	1	9	21	97,304	1,847	1,199
Texas:							
North Central	22	0	25	47	115,263	1,523	1,519
West	28	0	3	31	151,503	1,603	923
Panhandle	4	0	2	6	18,564	310	183
Eastern	4	1	4	9	53,815	325	316
Gulf Coast	8	2	6	16	110,544	1,278	487
Southwest	4	0	6	10	31,422	668	953
Total Texas	70	3	46	119	481,111	5,707	4,381
Louisiana:							
Northern	4	1	8	13	66,148	333	349
Southern	4	0	1	5	46,212	483	365
Total Louisiana	8	1	9	18	112,360	816	714
Arkansas	2	0	3	5	25,541	220	281
Mississippi	2	0	3	5	30,291	163	110
Southeastern States	0	0	1	1	4,626	53	†
Montana	2	2	0	4	9,209	353	241
Wyoming	5	0	0	5	19,195	189	138
Colorado-Utah	2	0	1	3	10,737	39	30
New Mexico	6	0	4	10	33,554	407	245
California	38	2	7	47	160,582	2,016	1,396
Total United States	233	37	188	458	1,394,491	24,722	18,091
Total previous week	262	34	161	457			
Total Jan. 1, 1944	200	30	107	337			

*Includes 58 service wells. †Included in total shown for Mississippi.

CALIFORNIA

World's Deepest Well to Stop Drilling and Test

LOS ANGELES.—Standard Oil Co. of California stopped the drill in 20-13 Kern County Land in the South Coles Levee field of Kern County at 16,246 ft. and will conduct a series of tests before abandoning the hole. The well was stopped 967 ft. below the previous depth record drilled in Pecos County, Texas. The hole in Standard's deep test is in good condition, no tools of any kind being left in the well, and with 7-in. casing cemented at 10,990 ft. the company should be able to proceed with projected tests without difficulty. Drilling was suspended because, in the opinion of the company's engineers and field men, the equipment could not be expected to hold up much below 16,300 ft. and it was desirable to stop drilling before mechanical trouble developed. Only minor showings were encountered in this deep test below the Stevens sand of Miocene age and it would therefore prove surprising if deeper production should be found.

Standard's third deep well, 58 Cahn at Lost Hills is making hole at 5,010 ft. and it will be carried down to 10,000 ft. or deeper. This well has 16-in. casing cemented at 2,509 ft. All previous deep tests at Lost Hills have shown a high head water that presents a major problem. Standard hopes to overcome this problem successfully. This is a joint undertaking of several operators and nothing will be allowed to stand in the way of finishing a conclusive deep test if it is at all possible.

CALIFORNIA WILDCAT COMPLETIONS

Cymric outpost, Kern County: Superior 1 Midway Premier, 15-29s-21e, dry, no showings, TD 2,174 ft.

Jasmine wildcat district, Kern County: Rothschild Oil Co. 1 McDermitt, 24-25s-27e, dry in basement granite, top granite 2,274 ft., no showings, TD 2,325 ft.

Trico outpost well, Kern County: H. H. Magee, Amalgamated Happold, 15-25s-24e, dry, excellent indications logged during drilling but all sands tested wet, 7-in. casing cemented at 10,200 ft., TD 11,200 ft.

Whittier Heights outpost well, Los Angeles County: Bishop-Hilo 1 Lapworth, 4-2s-11w, dry in hard gray sand, no showings found, TD 4,248 ft.

EASTERN TEXAS

Lone Star Opens New Field in Henderson County

DALLAS.—Lone Star Production Co. 1 Lee, 2 miles north of Athens in Henderson County, has opened a new field from pay in the Bacon lime zone of the Rodessa section. Bottomed at 9,240 ft., pipe was perforated at 8,198-8,208 ft., and well was brought in flowing 12 to 15 bbl. of fluid hourly, 75 per cent oil, 25 per cent wash water, through ¼-in. choke. When shut in for 12 hours, pressure registered 2,300 lb. on casing and 1,800 lb. on tubing. The Texas Co. 1 Morse, another Henderson County wildcat 1 mile south of Chandler, ran electric log at 9,700 ft. then drilled ahead past 9,725 ft., probably near top of Travis Peak.

In Freestone County, The Texas Co. 1 McKnight, west of Fairfield, continued coring at 6,393 ft. in Travis Peak sand. Cores from 8,339-73 ft. consisted of fine-grained sand with odor and taste of distillate and slight oil stains. It previously has shown gas and distillate from sand in top of the Travis Peak section.

Slight showings of oil and gas encouraged hopes for opening a new producing area 6 miles northeast of Marshall, Harrison County, at Stanolind Oil and Gas Co. and Continental Oil Co. 1 Harris, in T. Gray Survey. After perforating pipe at 6,490-6,520 ft. in the Pettit zone, it was treated with 3,000 gal. acid and after swabbing down to 4,500 ft. was recovering 3 per cent green oil and 97 per cent fresh water, with about 100,000 cu. ft. of gas.

Another attempt is being made to develop production by a deep test in the Lone Star pool, Cherokee County, by W. H. Foster et al 1 Bowling. After standing idle for some weeks, work was resumed and the Rodessa section reperforated with 108 shots, then treated with 5,000 gal. of acid, and now is swabbing with fluid level standing at 3,000 ft. It recovers 2 to 3 bbl. fluid each trip of swab, about 10 per cent green oil with very small show of gas.

EAST TEXAS WILDCAT COMPLETIONS

Leon County: H. J. Baker 1 C. M. Well, John Scritchfield Sur., 3 mi. N Normangee, elev. 440 ft., dry, TD 2,886 ft.

Wood County: Bobby Manziel 1 V. L. Evans, J. Storks Sur., 2 mi. E Quitman, elev. 440 ft., Sub-Clarksville 4,835-40 ft., Woodbine 5,370-80 ft., IP 32 bbl. day, gas-oil ratio 280, gravity 26.2, TD 6,100 ft.

SOUTHWEST TEXAS

Field Names Announced By Geological Society

CORPUS CHRISTI.—L. D. Ormsby 1 Williamson heirs, wildcat, 9 miles northeast of Floresville, in Wilson County, total depth 5,080 ft. in soft lime, set oil string, and drilling plugs. In drilling this hole, operators lost returns at 5,059 ft., regained circulation and drilled ahead to 5,080 ft. where the well tried to blow out. Pressure was killed. It is now making some oil through surface casing, heavy pressure apparently causing the producing string to leak.

Magnolia Petroleum Co. 1 Boyd Ranch, in Fannin field, Goliad County, recovered 180 ft. of oil-cut mud and 450 ft. of fluid, 50 per cent oil and 50 per cent water, on drill-stem test on perforations at 4,257-60 ft. Reperforated at 4,258-62 ft. and packer failed on attempted drill-stem test. Operators are attempting another drill-stem test.

Humble Oil & Refining Co. 40 King Ranch-Paso Ancho, Stratton field in Kleberg County, on 24-hour test, flowed 148.77 bbl., ½-in. choke, tubing pressure 900 lb., gas-oil ratio 670 to 1, from perforations at 6,443-51 ft. Total depth 6,580 ft.

Lockhart & Davenport 5 J. B. Heard estate, Cameron field in Starr County, on 24-hour potential test, made 196.61 bbl. through 11/64-in. choke, tubing pressure 500 lb., casing pressure 725 lb., gas-oil ratio 325 to 1, gravity 45.5°, from 48 perforations at 4,146-55 ft.; total depth is 4,158 ft. with 5½-in. casing set at 4,158 ft.

South Texas Geological Society has announced the following new field names:

Brooks County: The name "East Alta Mesa" has been given the field discovered by Standard Oil Co. of Texas 4 Braulio G. de Garcia, La Encantada Grant, 1½ miles southeast of Alta Mesa field.

Starr County: The name "Jakalak" has been given the field discovered by T. E. Stephens 4 Hinojosa estate, Porcion 111, 35 miles northwest of Rio Grande City.

SOUTHWEST TEXAS WILDCAT COMPLETIONS

Calhoun County: Lewis Lawlor 1 Frank Kabele in Valentine Garcia Sur., 6 mi. north of Port Lavaca, dry at 6,372 ft.

De Witt County: Arkansas Fuel Oil Co. 1 Ernest Richter, in Geo. W. Brooks Sur., 4 mi. southwest of Clinton, dry at 9,015 ft.

Duval County: J. W. Gorman and McDermott 1 J. F. Welder, in J. Poitevent Sur., 6 mi. northeast of Freer, is dry at 2,871 ft.

Jim Wells County: Naylor Oil Co. 1 Jno.

DAILY AVERAGE PRODUCTION FOR WEEK

	Dec. 30 crude oil	Distillate, allied products	January PAW quota all oils	Dec. 23 crude oil
Arkansas	80,750	4,900	84,900	80,550
California	885,250	59,800	947,800	888,750
Colorado	8,650	.....	9,500	7,650
Eastern	62,450	8,550	76,750	59,500
Illinois	202,800	12,000	212,000	204,200
Indiana	12,400	.....	12,500	12,800
Kansas	271,100	6,000	280,000	279,200
Kentucky	32,500	2,800	34,800	33,200
Louisiana	360,650	36,000	391,000	361,050
North Louisiana	71,000	.....	.....	71,450
South Louisiana	289,650	.....	.....	289,600
Michigan	54,000	600	47,600	52,750
Mississippi and Southeast*	52,300	.....	53,300	52,250
Montana	23,600	350	23,350	23,550
Nebraska	1,000	.....	1,200	1,000
New Mexico	103,000	5,600	110,600	103,050
Oklahoma	360,000	26,000	378,000	359,400
Texas	2,111,600	150,000	2,274,000	2,111,550
East Texas	371,000	.....	.....	371,000
East Central Texas	141,500	.....	.....	141,450
North Central Texas	140,550	.....	.....	140,600
Texas Panhandle	88,800	.....	.....	88,750
West Texas	471,300	.....	.....	471,350
South Central (S.A.)	20,050	.....	.....	20,050
South Texas (Laredo)	79,000	.....	.....	79,000
Lower Gulf Coast	246,300	.....	.....	246,400
Upper Gulf Coast	553,100	.....	.....	552,950
Wyoming	92,300	3,500	103,500	91,100
Total United States	4,714,350	316,100	5,040,800	4,721,550
Change from previous week	down 7,200	.....	.....	.....
Total production January 1-December 30, 1944				1,668,127,660
Same period last year				1,497,869,485

*Includes 200 bbl. Alabama production.

"NEVER TOO OLD TO EARN"

THE first "Caterpillar" Diesel Tractor ever built and sent out in 1931 to earn money for its owner is still in service. But there are hundreds of even older machines still in active service. In the picture below, the tractor at the right is an 18-year-old "Caterpillar" Sixty. We'll let its owner, J. Hugo Aronson, General Contractor, Cut Bank, Mont., tell about it. In a letter he says:

"This 1927 'Caterpillar' Sixty Tractor has taken its place among my Model D7 'Caterpillar' Diesel Tractors, and is upholding its reputation of dependability in fine style. Thanks to the Connelly Machinery's fine service, this tractor, which a short time ago was regarded as a has-been, is now serving the war effort in the production of petroleum. This is a striking example of the importance of purchasing machinery that is backed by dependable service."

(Signed) J. HUGO ARONSON

Fine engineering, quality manufacture, expert and readily available mechanical service through the most complete service-dealer organization of its kind in the world, have given "Caterpillar" Diesel Tractors, Engines and Motor Graders a matchless and well-merited reputation for long-lived performance, dependability and earning capacity.

New "Caterpillar" Diesels are coming

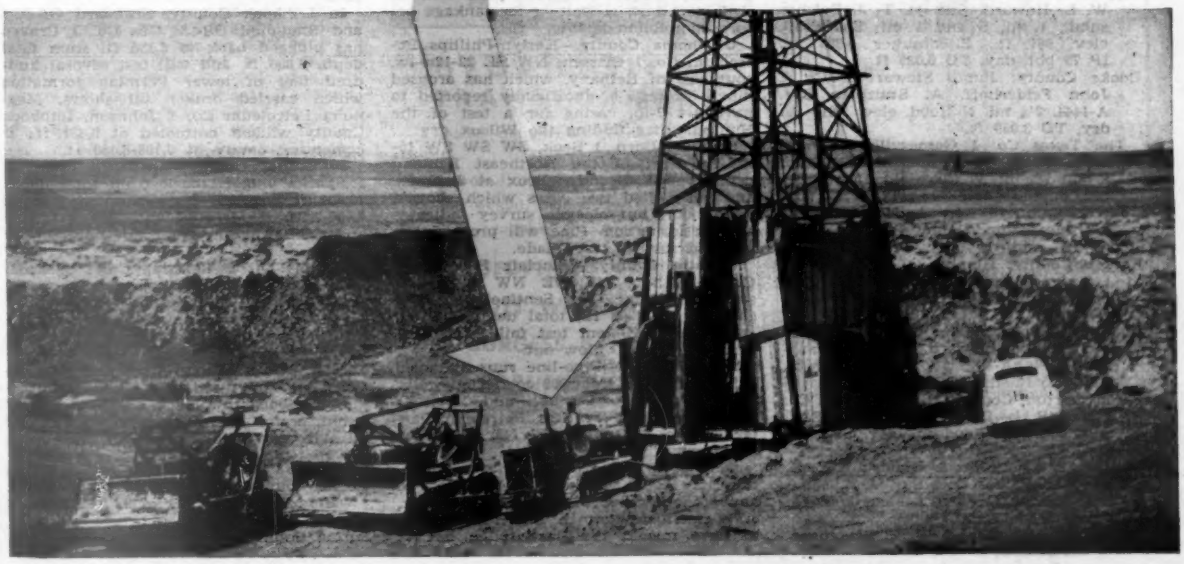
As war demands slacken, there will be more and more "Caterpillar" Diesel products available for the peacetime needs of the oil and other industries. Seeing your "Caterpillar" dealer and placing your orders without delay will bring you delivery that much sooner.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT



W. Bird, Captain Lucey area, in Los Presenos De Abajo Grant, is dry at 5,494 ft.

Victoria County: Catahoula Oil & Gas Co. 1 Mrs. Etta Terrell, in Ed McDonough Sur., 12 mi. southwest of Victoria, is dry at 5,515 ft.

Webb County: R. F. Schoolfield 1 Killam-Bruni, in Las Albercas Grant, 8 mi. southwest of Bruni, is dry at 2,760 ft.

N. CENTRAL TEXAS

Second Test Appears Better Than Discovery

WICHITA FALLS.—The Texas Co. 1 Beasley, second test drilled by the company on prospect north of Sivels Bend, northern Cooke County, appears to be a better well than the 1 Rasure discovery pumper, nearly a mile to northeast. The 1 Beasley, bottomed at 6,904 ft. with 7-in. cemented at 6,898 ft., perforated at 6,817-63 ft. with 179 shots, started flowing by heads after swabbing tubing down 3,000 ft. The new well is reported to have checked about 60 ft. higher structurally than the discovery, but its producing sand is approximately 100 ft. lower in the Strawn section than the producing sand in the discovery.

Kerlyn Oil Co. 1 H. C. Haye, Cooke County wildcat 2 miles east of Gainesville, recovered some oil-cut mud and a very small amount of free oil on drill-stem test of sand between 2,165-78 ft. and is drilling ahead below 2,700 ft.

In the new Odell pool, Wilbarger County, Humble Oil & Refining Co. 1 Morgan-Berry has been completed flowing 156 bbl. oil in 4 hours through ¾-in. choke from Palto Pinto lime pay through perforations at 4,725-40 ft. The Texas Co. 1 Pigg, west edge of the area, made 256 bbl. oil plus 44 bbl. salt water from 4,744-85 ft. and is trying to plug off water. Fain-McGaha Oil Corp. 1 Roy Wilkinson logged saturated lime at 4,784-88 and 4,810-34 ft. and has cemented casing at total depth 4,956 ft.

Anderson-Prichard Oil Corp. 1-A Wood, northwestern Clay County discovery in Section 12, M.E.P.&PRR Survey, on last gage flowed 205 bbl. oil in 13 hours through ⅝-in. choke, from pay through perforations at 5,935-40 ft.

NORTH CENTRAL TEXAS WILDCAT COMPLETIONS

Clay County: Phillips Petroleum Co. 1-A W. L. Howard, Blk. 44, T. J. Belcher subd., 1 mi. S and 1 mi. E Halsell, elev. 961 ft., Ellenburger 5,836 ft., IP 75 bbl. day, TD 6,035 ft.

Cooke County: James Stewart & Co. 1 John Felderhoff, A. Stutzman Sur. A-1444, 2½ mi. N Hood, elev. 1,013 ft., dry, TD 3,059 ft.

The Texas Co. 1 Gainesville National Bank, T. W. Ward Sur. A-1089, 3 mi. S and 1½ mi. W Coesfield, flowed 331 bbl. day through 2-in., TD 5,727 ft.

Grayson County: Lee Andree et al 1 Whiting estate, Daniel Dugan Sur., 3 mi. W Ambrose, dry, TD 3,047 ft.

Haskell County: Humble Oil & Refg. Co. 1 S. W. Scott, Sec. 20, G. W. Brooks Sur., 3 mi. S and 9 mi. E Haskell, elev. 1,447 ft., dry, TD 3,290 ft.

Montague County: Highlander Gasoline Co. 1 Roxie Howard, Blk. 91, Kaufman CSL A-407, 5½ mi. N Bonita, elev. 905 ft., dry, TD 4,466 ft.

Throckmorton County: Bridwell Oil Co. 1 Mrs. R. L. Parrott, Sec. 976, TE&L Sur., 3 mi. N Woodson, elev. 1,270 ft., dry, TD 2,000 ft.

Wichita County: Akin & Dimock 1 W. B. Honaker, James Cole Sur. A-37, 5 mi. E and 3 mi. N Electra, elev. 1,098 ft., dry, TD 1,932 ft.

C. B. Christie et al 1 W. T. Waggoner, Sec. 1, GC&SF Sur. A-531, 1 mi. S and W Electra, elev. 1,168 ft., dry, TD 2,250 ft.

Threat & Simpson 2 W. T. Waggoner, Sec. 1, GC&SF Sur. A-531, 1 mi. S and 1½ mi. W Electra, dry, TD 1,032 ft.

Young County: John W. Harris 1 J. L. Rhodes, J. S. Fore Sur. A-1309, 1 mi. N and ½ mi. E Bunger, elev. 1,074 ft., Caddo 3,609 ft., Ellenburger 4,606 ft., dry, TD 4,620 ft.

F. B. Paine Drlg. Co. 1 Mrs. Mary Criswell, A. B. Ledbetter Sur. A-1689, 3 mi. E and 1 mi. N Bunger, elev. 1,058 ft., Caddo 3,636 ft., dry, TD 3,656 ft.

WEST CENTRAL TEXAS WILDCAT COMPLETIONS

Palo Pinto County: W. K. Gordon 5 Mrs. J. W. Conway, Sec. 59, Blk. 2, T&P Sur., 8 mi. N Gordon, elev. 1,228 ft., Marble Falls 3,568-76 ft., dry, TD 3,576 ft.

OKLAHOMA

Year Ends in Flurry of Promising Wildcat Tests

OKLAHOMA operators ended the year with a flurry of excitement about several promising wildcats.

Canadian County.—Amerada Petroleum Corp. 1 Lawson, NE SE NW 18-11n-5w, north of Mustang in southeastern Canadian County, dashed hopes of another Hunton lime discovery when drill-stem test at 8,490-8,515 ft. recovered only mud and salt water. This test checked low on upper formations, but suddenly thinned markedly between the Viola and the Hunton, throwing the Hunton high. It will be carried on down to the Wilcox.

Cleveland County.—Magnolia Petroleum Co. 1 Anneler, SW NE 26-6n-1w, southeast of Lexington in southern Cleveland County, has encouraging signs in the Bartlesville sand from two drill-stem tests. Top of Bartlesville is 6,080 ft., first test at 6,075-85 ft. showed gas in 10 minutes and when tester was pulled, recovered 120 ft. of oil, 140 ft. of oil-cut mud and 75 ft. of slightly brackish drilling fluid. Second test at 6,082-93 ft., open 1 hour, recovered 240 ft. of oil, 90 ft. of oil-cut mud and 30 ft. of less brackish water than the first test.

O. G. Harp Poultry & Egg Co. 1 Metthesen, NE NW NE 19-10n-2w, east of the Moore pool, which showed for a possible very large Bartlesville sand well on drill-stem test, is waiting for tankage before completion testing.

Oklahoma County.—Kerlyn-Phillips Petroleum Co. 1 Classen, NW SE 22-12n-4w, southeast of Bethany, which has aroused much interest, is unofficially reported to have set 7-in. casing for a test of the Hunton, after finding the Wilcox dry.

Gulf Oil Corp. 1 Beck, SW SW SW 15-14n-2w, east of the Northeast Edmond pool, topped second Wilcox at 6,175 ft., and has pulled two cores which showed some odor, but electric survey indicates a tight formation. Pipe will probably be run and further tests made.

Washita County.—Sinclair Prairie Oil Co. 1 Bishop, NE NE NW 31-8n-19w, southeast of the West Sentinel pool, had gas at 6,850-6,903 ft., total depth, but an attempted drill-stem test failed, and the well is trying to blow out.

West Edmond.—Pipe-line runs averaged 45,500 bbl. daily from 309 connected wells, an increase of 2,550 bbl. and 17 wells from last week. Phillips Petroleum-Carter Oil Co. 1 Dublin, NE NE 18-15n-4w, once considered a potential north extension well, on which official information has been withheld, is reported to have found water in the second Wilcox, only small staining in the Hunton, and to have missed the Bartlesville, but to be preparing to test the Pennsylvanian section.

OKLAHOMA WILDCAT COMPLETIONS

Beckham County: Phillips 1 Nanee, SW SE NW 8-7n-25w, dry, TD 2,291 ft., granite wash 2,110 ft., granite 2,260 ft.

Creek County: Creekmore-Rooney et al 1 Stone, SE NW SE 33-18n-9e, dry, TD 3,296 ft., Wilcox 3,257 ft.

Hughes County: MacMillan 1 Wells, SE SW SE 25-7n-8e, dry, TD 3,937 ft., Cromwell 3,812 ft.

Jefferson County: Bridwell 1 Haviland, NW NW SE 33-6n-6w, dry, TD 2,183 ft.

Kay County: B. B. Blair 1 Clavier, NE SW NW 25-28n-3e, dry, TD 3,410 ft., Arbuckle 3,385 ft.

Lincoln County: Wofford et al 1 State, E/2 NE NE 16-15n-6e, dry, TD 3,071 ft., Verdigris 3,062 ft.

Noble County: Mid-Continent et al 1 Robertson, NW SE NE 30-24n-1w, dry, TD 4,511 ft., second Wilcox 4,486 ft.

Okfuskee County: Wilcox 1 Wind, NE NE SW 31-11n-10e, 6,000,000 cu. ft. gas from pay zone 2,920-60 ft., TD 2,960 ft., Gilcrease 2,800 ft., Dutcher 2,924 ft.

PERMIAN BASIN

Hockley County Test May Make Small Well

MIDLAND.—The Texas Co. 1 Montgomery, wildcat 4 miles north of Slaughter field, Hockley County, is showing for a small well after using 4,000 gal. acid on lime showing oil from 4,765-68 and 4,823-32 ft., with total depth 4,890 ft. On latest test, it swabbed 154 bbl. fluid in 24 hours, cut 24 per cent b.s. and water. Another Texas Co. wildcat, 3-B Hobbs, over a mile northwest of the 5,300-ft. Crossett field in southern Crane County, has established a new and shallower pay for the area. After showing nothing in deeper zones to total depth of 6,710 ft. it plugged back and perforated pipe at 3,190-3,210 ft. opposite the Holt zone, used 2,000 gal. acid and is flowing 12 to 15 bbl. fluid per hour, cut about 30 per cent b.s. and w.

Lynn County's deepest wildcat, Phillips Petroleum Co. 1-A Bartley, in northeast corner of the county was waiting on plugging orders at total depth 9,909 ft. in granite topped at 9,900 ft. It logged Ellenburger from 9,352-9,860 ft., but showed only mud and water on drill-stem tests.

In Lubbock County, Seaboard Oil Co. and Stanolind Oil & Gas Co. 1 Craven has plugged back to 6,150 ft. from total depth 8,800 ft. and will test several hundred feet of lower Permian formation which carried broken oil shows. Magnolia Petroleum Co. 1 Johnson, Lubbock County wildcat bottomed at 9,431 ft., is cementing cavity at 6,186-6,450 ft.

In Gaines County, Shell Oil Co., Inc. 1 Sparks plugged back from total depth 10,604 ft. to 7,520 ft., perforated pipe at 7,450-7,500 ft., treated with 500 gal. acid and was swabbing with no shows of oil or gas.

Humble Oil & Refining Co. 1 Jackson, Lamb County discovery producer, on official potential gage pumped 248 bbl. oil plus 94 bbl. water in 24 hours, gas-oil ratio 160 to 1, oil 29° gravity, from broken lower Permian lime pay between 5,348-6,006 ft. In Tom Green County, The Texas Co. 1 Gorman used 2,000 gal. acid after plugging back to 5,004 ft. and is swabbing 1 bbl. water per hour with a scum of oil and very slight amount of gas.

WEST TEXAS WILDCAT COMPLETIONS

Pecos County: B. F. Phillips 1 H. K. Hinde, Sec. 27, Blk. 178, TCRR Sur., dry, TD 1,941 ft.

Sutton County: S. B. Roberts 1-B Geo. S.

Allison, Sec. 57, Blk. C, TW&NG Sur., elev. 2,323 ft., Ellenburger 5,065 ft., dry, TD 5,608 ft.

Yoakum County: Woodley Petroleum Corp. 1 Ruth Googins, Sec. 249, Blk. D, Jno. H. Gibson Sur., 5½ mi. NW Plains, elev. 3,732 ft., Yoakum 4.140 ft., dry, TD 5,505 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Barney Cockburn 1 Wyatt-State, deep wildcat 1½ miles southeast of Maljamar field, bottomed at 7,020 ft., is trying to land 5½-in. casing string on bottom. With pipe swung at about 6,800 ft. it swabbed 125 bbl. fluid in 8 hours, lowering fluid 2,000 ft. from surface, then filled up to within 200 ft. of top in 75 minutes. Phillips Petroleum Co. 4 Lea-Mex, deep wildcat north of Maljamar East Extension area, is drilling below 8,515 ft. in lime with no shows reported. Stanolind Oil & Gas Co. 1-P State, on south edge of West Eunice field, was killed after blowing wild for several days at estimated rate of 500 bbl. per hour, and casing is being run. Humble Oil & Refining Co. 1 Federal-Keinath, 6 miles northwest of Eunice, is coring below 9,720 ft. in lime with no shows.

SOUTHEASTERN NEW MEXICO WILDCAT COMPLETIONS

Lea County: Harvey E. Yates 1 Cities Service-State, 27-16s-33e, elev. 4,187 ft., Yates 2,760 ft., dry, TD 5,004 ft.

The Texas Co. 1 Knight, 13-19s-32e, East Lusk area, elev. 3,646 ft., dry, TD 4,240 ft.

A. W. Cherry & Barron Kidd 1 Carder, 21-19s-33e, elev. 3,622 ft., dry, TD 3,600 ft.

ROCKY MOUNTAIN

South Elk Basin Area Indicates New Discovery

DENVER. — Additional evidence of a closed structure on the South Elk Basin high in Park County, Wyoming, with favorable indications of a discovery in the Embar-Tensleep series was encountered in Continental Oil Co. 1 Ida Goodstein, NE SE SW 20-57n-99w, when it drilled into the Dakota sand at 5,390 ft. A drill-stem test at 5,390-5,439 ft., open only 4 minutes and 45 seconds, showed a large volume of gas, estimated at 10,000,000 to 12,000,000 cu. ft. per day. It previously had shown approximately 3,000,000 cu. ft. of dry gas in the second Frontier in a drill-stem test at 4,354-90 ft., open 16 minutes. The test is approximately 3 miles south of the nearest producer in Elk Basin. The Frontier in the last-named field is encountered on top of the dome at 1,400 to 1,600 ft., indicating a condition somewhat similar to that found at Clark's Fork, 6 miles west of the Elk Basin field on the Montana side where General Petroleum Corp. topped the second Frontier at 6,450 ft. and brought in a 200-bbl. 48-gravity discovery.

Deep test at Badger Basin.— General Petroleum Corp. may establish a record for deep wells in the Rocky Mountain area in its 7 Resolute, C NW SW 8-57n-101w, Badger Basin field, Park County, Wyoming, which is drilling below 6,700 ft. It is reported headed for the Tensleep, the big producing horizon in Elk Basin, which is expected at around 12,000 ft.

North McCallum extended.—Continental Oil Co. 1 Webster, C NW NW 18-9s-78w, which was completed in the Lakota through perforations at 5,356-5,412 ft. for 181 bbl. of oil and 10,745,000 cu. ft. of carbon dioxide gas, extends the developed proven area of the North McCallum

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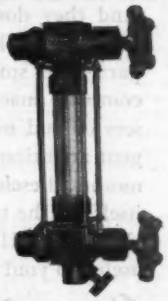

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field in northern Colorado a mile to the southeast.

Sinclair discovery at Bailey.—Sinclair-Wyoming Oil Co. 1 Coffman, SE NE NE 21-26n-89w, Bailey structure, Carbon County, Wyoming, which filled up at the rate of 35 bbl. an hour of 34.6-gravity oil from the upper part of the Sundance in a drill-stem test at 5,160-5,206 ft., took another test at 5,203-5,222 ft., which showed 1,500 ft. of oil-stained water and gas estimated at 10,000,000 cu. ft.

Powder River gas discovery.—Stanolind Oil & Gas Co. 1 La Fleiche, NE NE SE 23-36n-85w, Powder River station, Natrona County, Wyoming, erroneously reported dry in the Tensleep last month, was deepened from 4,237 ft. to 4,889 ft. to test the Madison. After finding water in that horizon it plugged back to 3,028 ft. and perforated with 21 holes opposite the Sundance sand at 2,489-2,509 ft. and completed for 4,800,000 cu. ft. of gas in that horizon. It is a discovery.

MONTANA WILDCAT COMPLETION

Keith Prospect, Liberty County: Texas Co. 1 Cicon, NE NW SW 29-36n-6e, TD 3,221 ft., top Ellis 2,726 ft., Ribbon sand 2,665 ft., Madison 2,990 ft., 6,000,000 cu. ft. sweet gas at 2,875-2,913 ft., 1,080 lb. rock pressure, 5,170,000 cu. ft. sulfur gas at 2,938-90 ft.

COLORADO WILDCAT COMPLETIONS

Chromo, Archuleta County: Malco Refineries, Inc. 1 Fitzhugh, SW SE NE 3-32n-1e, TS 565 ft., dry and abd. in the Dakota.

North Fort Collins, Larimer County: Tripod Oil Co. 1 Community, SE NE 18-8n-68w, TD 4,759 ft., plugged back to 4,750 ft., completed in Muddy sand, top at 4,725 ft., for 75 bbl. per day in swabbing test.

North McCallum, Jackson County: Continental Oil Co. 1 Webster, NW NW 18-9n-78w, TD 5,413 ft., top Dakota 5,269 ft., Lakota 5,330 ft., perf. liner at 5,356-5,412 ft., 277 holes, 181 bbl. oil and 10,745,000 cu. ft. carbon dioxide gas, extension on southeast.

NORTHWEST NEW MEXICO WILDCAT COMPLETION

Willow Creek, Rio Arriba County: R. S. Rhodes 1 Sargeant estate, SE NE 23-31n-3e. Dry and abandoned at 880 ft., no shows.

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TEXAS GULF COAST

Four Dry Holes in Spring Since Eltex Completion

HOUSTON.—Sinclair Prairie Oil Co. 2 C. G. Glasscock, discovery well in Collier Survey, about 6 miles north of Rock Island in Colorado County, was officially completed flowing 120 bbl. of 51°-gravity condensate per day, with 4,900,000 cu. ft. gas, through ¼-in. choke, tubing pressure 1,500 lb., casing pressure 1,635 lb., no water reported. Total depth is 10,518 ft., 5½-in. at 10,300 ft., perforated with 20 holes at 9,203-08 ft., 40 holes at 9,216-26 ft., and 44 holes at 9,274-80 ft. The well was not dual completed.

Pan American Production Co. 1 Williams, wildcat, 8 miles west of Eagle Lake, which recently recovered some 42.7°-gravity green oil on drill-stem test at 8,372-90 ft., ran drill-stem test at 8,916-41 ft. but found the formation too tight to produce. Zero working pressure was shown with 975 lb., bottom-hole pressure flowing, recovered water cushion and nothing else. The test is being drilled ahead from 9,097 ft.

The Texas Co. 1 Mrs. Madge Hopkins, wildcat in R. H. Davis Survey, prospective discovery about 3 miles northeast of Addicks in Harris County, is flowing at the rate of 3 bbl. a day, through ¼-in. choke and showing tubing pressure of 20 lb. It is testing in perforations at 7,702-08 ft. and it is believed the flow may increase as the hole cleans itself. Total depth is 8,014 ft. with 5½-in. set at 7,760 ft.

Sinclair Prairie has opened two new sands, one oil and one gas, at the 1 Stovall, southeast quarter of Section 72, and an east offset to the discovery well at Daboval field, Wharton County. The 1 Stovall showed a flow of 127 bbl. of pipeline oil daily from 32 perforations at 5,498-5,506 ft. on 9/64-in. choke, tubing pressure 1,025 lb., and is testing for open flow gas potential in perforations, 32 shots, at 5,550-58 ft. Total depth of the hole is 7,312 ft.

Phillips Petroleum Co. 1-A Houston Farms Development Co. at Chocolate Bayou in Brazoria County, is completed in perforations at 11,470-480 ft., flowing 60 bbl. in 5 hours through 5/16-in. choke, with 6,813,000 cu. ft. gas daily, tubing pressure 3,550 lb. Total depth of the hole is 11,555 ft., with 5½-in. casing set at 11,541 ft., and 2⅜-in. tubing on packer at 11,410 ft.

Humble Oil & Refining Co. 1 M. E. Mayes, new producer at Smith Point in Chambers County, is waiting on potential test after flowing 32 bbl. in 1 hour of 40.3°-gravity oil through ¼-in. choke from perforations at 8,166-69 ft., plugged back total depth 8,180 ft., 5-in. liner and screen set. Tubing pressure was 1,525 lb., gas-oil ratio 662 to 1. Total depth of the hole is 9,994 ft.

Meco Production Co. 2-A Tom E. Cockrill, in the Cistern area of Fayette County, is completed pumping 108 bbl. a day of 19°-gravity oil, plus 10 per cent b.s. and water. First sand pay reported 1,160 ft. Total depth 1,177 ft., with 5½-in. set at

1,167 ft., screen set and 2-in. tubing at 1,140 ft.

W. L. Goldston et al 2 F. J. Hurta, new producer in the Needville field of Fort Bend County, dual completed as a gas well in perforations at 5,175-85 ft., no gage, and as an oil well in perforations at 6,546-54 ft. Total depth is 6,775 ft. It flowed a potential of 147 bbl. a day on ⅛-in. choke from perforations at 6,546-54 ft., gas-oil ratio 420 to 1, tubing pressure 810 lb., gravity 28°, no water.

Glen H. McCarthy 1 Edward E. Lemm, wildcat 1½ miles south of the discovery well at Spring field, Harris County, is reported dry at 6,357 ft. after running electric log. It had some sand in the Cockfield at 6,275-6,310 ft. but failed to show commercial possibilities. This is fourth dry hole drilled in Spring area since completion of the Eltex, Ltd. 1 Bender estate, discovery well of Spring field.

UPPER GULF COAST WILDCAT COMPLETIONS

Colorado County: Sinclair Prairie Oil Co. 2 C. G. Glasscock, discovery, in Collier Survey, 6 mi. north of Rock Island, TD 10,518 ft., 5½-in. casing at 10,300 ft., perforated with 20 holes from 9,203 to 9,226 ft., and 9,274 to 9,280 ft., PT 120 bbl. condensate day ¼-in. choke, 4,900,000 cu. ft. gas day, tubing pressure 1,500 lb., casing pressure 1,635 lb., gravity 51°, no water.

Harris County: Glenn H. McCarthy 1 Edward E. Lemm, in Wm. Lemm Sur., 1½ mi. south of Spring, dry at 6,357 ft.

Wharton County: H. M. Amsler 1 Mrs. M. L. Heard, in T. J. Winston Sur., south of Louise, dry at 6,522 ft.

APPALACHIAN FIELD

South Penn Further Restricts Sales to Refiners

PITTSBURGH.—South Penn Oil Co., marketers of Pennsylvania Grade crude, announced that for the month of January 1945, sales to refiners would be further restricted and would be 60 per cent of the rateable set May 1943. This is a reduction from the first half of December when 70 per cent was allowed but which due to the heavy snows and ice was reduced to 55 per cent for the remaining half month.

In Crawford County, western Pennsylvania, the second test of Appalachian Development Corp. in Beaver Township failed to extend the discovery of Oriskany gas struck in the test on the Alpha Cozadd farm. The new test on F. M. Walton farm, starting at an elevation of 1,006 ft., logged the Tully lime at 1,981-96 ft., Onondaga 2,144-2,390 ft., Oriskany 2,390-99 ft. with salt water showing a film of dark oil at 2,391½ ft. and total depth 2,427 ft.

On Chestnut Ridge in Wharton Township, Fayette County, New Penn Development Co. et al is drilling at 7,690 ft. in the east flank wildcat on J. P. Thompson farm or 199 ft. in the Onondaga chert and without showing gas.

In West Virginia, where a large number of wells are still shut down due to weather conditions, the wildcat of Joe Rubin on W. H. Mitchell farm in Ravenswood district, Jackson County, drilled through the Oriskany sand with a gage of only 70,000 cu. ft. gas. The Corniferous lime was logged at 4,790-4,900 ft.; Oriskany 4,900-43 ft., show gas 4,900 ft., gas 4,907 ft., total depth 4,945 ft. It will be shot when weather conditions permit.

In Clay County, Virginian Gasoline & Oil Co. completed 1,359 Brown, Swann & Goshorn, in Henry district, as an Injun sand oil well, total depth 1,886 ft. In passing through the Big Lime, there was a fair showing of oil which will be acidized as soon as weather conditions permit and if commercial, will be produced with the Injun oil. This is a new horizon.

In southeast Ohio, a new Oriskany gas pool is indicated with the completion by Ohio Oil Co. of a test on John F. Barnett farm, NE Section 14, Knox Township, Columbian County, which gaged 5,900,000 cu. ft. gas after shot. With a derrick-floor elevation of 1,150 ft., the Oriskany sand was logged at 3,543-75 ft., and total depth 3,596 ft.

SOUTH LOUISIANA

Humble Completes Test In LaFourche Parish

NEW ORLEANS.—Humble Oil & Refining Co. 3 C. W. Hopkins, in Delta Farms field, LaFourche Parish, is completed through perforations at 9,039-46 ft., flowing 240 bbl. daily, 5/32-in. choke, gas-oil ratio 551 to 1, gravity 33.2°, 0.1 per cent water. Total depth is 9,058 ft. with 5½-in. casing set on bottom and 2-in. at 8,975 ft.

Humble 2 Virginia Prince et al, Krotz Springs field, St. Landry Parish, total depth 10,376 ft., with 7-in. casing set at 9,526 ft., flowed potential of 129 bbl. per day through ⅛-in. choke, 36.6° gravity, no water, through perforations at 9,410-13 ft.

The Texas Co. 4-A Arestide Broussard et al, in Erath field of Vermilion Parish, is completed through open hole at 7,748-63 ft., flowing 153 bbl. day through 7/64-in. choke, gravity 32.6°, no water. Total depth is 7,763 ft. with 5½-in. casing set at 7,748 ft.

Phillips Petroleum Co. 1 Bob, wildcat near Henderson, Section 28-8s-7e, in St. Martin Parish, is drilling below 10,800 ft.

Pure Oil Co. 2 Benoit Unit, in southeast flank at West Gueydan dome, Vermilion Parish, is waiting on cement to set with 5-in. casing set on bottom at total depth 10,772 ft.

ILLINOIS

Only 20 Completions During Christmas Week

CENTRALIA.—The Christmas holidays were responsible for a slowing-up of operations in Illinois in the past week, and only 20 completions were reported, of which 10 were oil wells and 10 dry holes. Four wells completed in White County were all dry, but W. I. Lewis et al 1 H. W. Burkhardt, SE NE SW 18-5s-9e, in White County, a near-completion, pumped 218 bbl. in a 24-hour test of Cypress sand at 2,843-55 ft., which had been shot. The wildcat is 4 miles from other production.

In Wabash County C. E. Skiles et al 3-C Baumgart, near C N½ SW SW 5-1s-12w, in the Mount Carmel pool, flowed 522 bbl. in 24 hours from McClosky lime. It had not been acidized. It was not a completion.

ILLINOIS WILDCAT COMPLETIONS

Edwards County: S. C. Yingling 1 Smithwick-Bare Community, NE SE NW 6-1n-10e, dry at 3,377 ft. Glen Dean 2,666 ft., Barlow 2,871 ft., Ste. Genevieve 3,217 ft.

Jasper County: Texas 1 J. Huddleston, NW SW NE 13-6n-9e, McClosky lime 2,929-36 ft., pumped 39 bbl. oil and 22 bbl. of salt water, TD 3,022 ft.

Wayne County: Gulf Refining 1 May Keith, NE NE SE 19-2n-7e, dry at 3,289 ft. Lower Glen Dean 2,579 ft., Barlow 2,758 ft., Benoist 2,980 ft., Aux Vases 3,042 ft., Ste. Genevieve 3,105 ft., Fredonia 3,144 ft., McClosky 3,171 ft.

White County: E. E. Brehm et al 1 Mary Miller, SW SW NW 26-4s-9e, dry at 3,366 ft. No log.

OHIO, KENTUCKY

Ohio Oil Completes Year's Most Encouraging Strike

COLUMBUS.—The most encouraging discovery of the past year was completed by Ohio Oil Co. in the Oriskany sand in Knox Township, Columbiana County. The completion on John Barnett, Section 14, found the sand at 3,542-3,576 ft. with pay from 3,545-3,557 ft. A gage of 3,000,000 cu. ft. was taken before the well froze in, and 48 hours after shot a gage of 5,800,000 cu. ft. with 1,320 lb. pressure.

Brendel Producing Co. 1 Edward Ziegler, Lot 22, Dover Township, Tuscarawas County, extended the south end of the Sandyville field ½ mile to the west. Clinton sand at 4,881-4,943 ft. gaged 840,000 cu. ft. natural and shut in after shot at 1,247,000 cu. ft.

Preston Oil Co. 2 H. L. Morrison, Section 7, Harrison Township, Muskingum County, flowed 35 bbl. after shot from the Medina sand at 4,263-4,272 ft.

OHIO WILDCAT COMPLETIONS

Columbiana County, Knox Township: Ohio Oil 1 John Barnett, Sec. 14, Niagara lime 3,232 ft., Oriskany 3,542-3,576 ft., 5,800,000 cu. ft., TD 3,596 ft.

Muskingum County, Rich Hill Township: H. K. Porter 1 C. A. Richey, Section 29, Clinton 4,595-4,643 ft., dry, Medina 4,711-4,713 ft., dry, TD 4,779 ft..

WESTERN KENTUCKY

OWENSBORO.—Nine wells were completed in western Kentucky in the week in review, seven of the completions being oil wells, averaging 83 bbl. per well initial production.

WESTERN KENTUCKY WILDCAT COMPLETIONS

Union County: Thurston, Cooke & Locke 1 Hite, SE NW SE 4-P-20, Penn sand 1,030-41 ft. Pumped 5 bbl. oil and some water.

Robinson & Puckett 1 Ben Dyer, NW NE SE 4-P-20, 2 mi. NE of Sturgis, dry at 2,950 ft. Upper Menard 2,029 ft., Vienna 2,177 ft., Glen Dean 2,278 ft.

Webster County: F. W. Souerbry and M. B. Siegel 1 Oliver McCurry, 1½ mi. W of Sebree in 16-N-24, dry at 1,950 ft. No log.

EASTERN KENTUCKY

ASHLAND.—A sleet storm, low temperatures and bad highway conditions kept drilling operations at a low point in eastern Kentucky during the past few days, with the Christmas holidays also having a hand in cutting activities.

However, completions of three gas wells marked the reports from the various fields and several other wells are near the total depth levels.

Kentucky West Virginia Gas Co. completed well 759 on the C. P. Stephens land on Troublesome Creek in Knott County at a total depth of 3,208 ft. with a daily open flow of 337,000 cu. ft. of gas after shot from shale.

The same company also completed well 769 on the Dan J. Syck tract, Pater Fork of Lower Chloe Creek in Pike County, at a total depth of 3,458 ft. with a daily open flow of 133,000 cu. ft. of gas from shale after a shot. The company also re-

ported the completion of well 5558, John Hall farm on Mud Creek in Floyd County, at a total depth of 3,128 ft. The well has a daily open flow of 158,000 cu. ft. of gas from shale and 33,000 from Brown lime.

INDIANA

EVANSVILLE.—Three dry holes and a 144-bbl. well were reported completed during the past week, the oil well being Carter Oil Co. 1 Spencer-Myer, SW NE SW 1-7s-14w, Mount Vernon pool, Posey County.

INDIANA WILDCAT COMPLETION

Spencer County Texas 1 T. L. Joachim, SE NE SE 3-4s-5w, dry at 1,220 ft. Glen Dean 722 ft., Barlow 824 ft., Ste. Genevieve 972 ft., St. Louis 1,190 ft.

KANSAS

Three Wildcat Strikes Lead Week's Operations

RAYMOND GEAR et al 1 Carroll, SW NE SE 21-17-14w, north of the Boyd pool in Barton County, may be opening a new pool. Good saturation was logged when the Arbuckle was topped at 3,356 ft., and penetrated 1 ft. Operators are waiting for a drilling-in unit preparatory to testing.

In Rice County, Nelson Drilling Co. 1 Allison, NE NE NE 23-19-6w, has extended the Smyres pool to the northwest with a light well. Pumping potential of 15 bbl. of oil daily has been assigned to the well, which is producing from the chat, topped at 3,339 ft.

Hersfield Oil Co. 2 Love, NW SE SE 13-24-8w, is showing for a possible oil well with good porosity and saturation logged in the Lansing from 3,516 to 3,523 ft. Situated just north of the Abbeyville pool, this well is an eastern offset to the Skelly 1 Love test, which had good oil shows, but was abandoned. This test may be reconditioned and completed. The No. 2 Love is showing some gas as well as the oil, and pipe has been set on the bottom.

New locations for the week total 34, including 6 wildcats. Exploratory tests are scheduled for Cowley, Graham, Reno, Rice, Russell, and Saline counties. Completions for the week were low, with only 10 oil completions, 5 gas wells, and 13 dry holes. One successful wildcat was completed, Brunson Drilling Co. et al 1 Schmeidler, NW NW SE 28-12-17w, and was given a physical potential of 88 bbl. per day.

KANSAS WILDCAT COMPLETIONS

Butler County: J. E. Morris et al 1 Coulson, SE SW NW 3-26-6e, dry, TD 2,752 ft., Mississippi lime 2,736 ft.

Cowley County: Texas 1 Ott, SW SW SW 8-33-6e, dry, TD 3,579 ft., Arbuckle 3,519 ft.

Ellis County: Brunson Drilling et al 1 Schmeidler, NW NW SE 28-12-17w, physical potential 88 bbl. of 28°-gravity oil from pay zone 3,624-36 ft., TD 3,647 ft., Kansas City 3,394 ft., Arbuckle 3,625 ft.

Iron Drilling 1 Pfannenstiel, NW NW NE 2-15-18w, dry, TD 3,666 ft., conglomerate 3,583 ft., Arbuckle 3,632 ft.

McPherson County: Eldorado Refining 1 Kingsley, SW SW NE 34-17-5w, dry, TD 3,681 ft., Viola 3,620 ft.

Texas 1 Hedlund, SW NW NW 26-18-3w, dry, TD 3,775 ft., Arbuckle 3,736 ft.

J. C. Jansen et al Robertson, SW SW NW 21-19-2w, dry, TD 3,004 ft., Mississippi chat 2,981 ft.

Marion County: Weber Dental Co. 1 Voth, NW NW SE 32-20-1e, dry, TD 3,565 ft., Arbuckle 3,550 ft.

Ness County: Sinclair Prairie 1 Strauch, NW SW NE 4-18-22w, dry, TD 4,770 ft., Arbuckle 4,690 ft.

MISSISSIPPI

Important Wells Tested But Completions Are Few

JACKSON.—Humble Oil & Refining Co. 1-A Stowers in 9-8n-2w, Adams County, may be abandoned at its present depth of 12,012 ft. It is shut down awaiting owner's orders.

Pure Oil Co. 2 McDowell, in 12-6n-3w, in the Natchez field, Adams County, total depth 12,149 ft., is being tested in the 10,000-ft. horizon. It was tested at 10,270 ft. and during 43 hours flowed about 4 bbl. of fluid per hour, 40 per cent 50-gravity greenish brown condensate, and 60 per cent salt water. Perforations were squeezed off and it will be tested through perforations at about 10,311 ft.

Humble Oil & Refining Co. 1 Evans, in 15-2n-18w, a wildcat in Marion County, was coring at about 9,010 ft. after testing a hard finely grained sand at a total depth of 8,969 ft.

Gulf Refining Co. 1 Edwards-Bailey, in 27-10n-13e, the discovery well of the Soso area in Jasper and Jones counties, was cored to 6,696 ft., after a drill-stem test at 6,592-6,650 ft. recovered 12 ft. of water-white distillate. The sands penetrated below contained salt water, but there had been no water in the drill-stem test above recorded.

Morgan & Hager 1 Batson-Hatten, in 20-1s-12w, Forest County was dry at 8,549 ft., total depth. It had no showings

In the Eucutta field in Wayne County, Gulf Refining Co. 17 Stanley, NW NW 7-9n-8w, was completed flowing 97 bbl. per day at a total depth of 5,232 ft. Production is from perforations at 5,041-55 ft. and 5,117-32 ft.

MISSISSIPPI WILDCAT COMPLETIONS

Covington County: Freeport Sulphur 1 Watts, NE SE NE 20-6n-15w, dry, TD 1,808 ft.

Jones County: Sinclair-Wyoming 1 Scarborough, NW NE 35-7n-11w, dry, TD 8,515 ft., Massive sand 8,334 ft.

Lamar County: Shell 1 Hibernia Bank & Trust Co., 330 ft. south and 880 ft. east of NW cor. 14-2n-16w, dry, TD 9,565 ft., lower Cretaceous 9,270 ft.

GEORGIA WILDCAT COMPLETION

Wayne County: California 1 Brunswick Peninsula, 625 ft. north by 2,500 ft. east Land Lot 7, dry, TD 4,626 ft., quartzite 4,604 ft.

ARKANSAS WILDCAT COMPLETIONS

Union County: Lion 1 Mill, NW SE 34-18s-14w, dry, TD 7,414 ft., Smackover 7,345 ft.

Kerlyn Oil 1 Crossett, SW SW NW 9-19s-10w, dry, TD 5,415 ft., Cotton Valley 3,625 ft.

NORTH LOUISIANA WILDCAT COMPLETIONS

Bossier Parish: H. H. Temple 1 Pirkle, 2,067 ft. east and 660 ft. north of SW cor. 31-19n-12w, dry, TD 1,865 ft.

Catahoula Parish: California 1 Tensas Delta, N/2 SW SW 12-9n-7e, workover, OTD 9,215 ft., PB 8,608 ft., 25 bbl. distillate from pay zone at 8,512-44 ft.

Franklin Parish: C. L. Smith et al 1 Ely, SE SE SE 25-13n-7e, dry, TD 6,770 ft.

Morehouse Parish: Texas 1 Kennedy, SW SE 32-22n-6e, dry, TD 6,460 ft.

Red River Parish: Magnolia 1 Puckett, SE SE 11-14n-10w, dry, TD 3,994 ft.

Webster Parish: Phillips 1 Docia, 660 ft. south and 622 ft. west of NE cor. 18-22n-9w, dry, TD 8,758 ft.

Solid Oil Product Used as Fuel by Navy Jet Planes

A solid oil product made by The Texas Co., not ordinarily used as fuel, is employed in the 330-hp. rockets under the fuselage of the Navy's heavily loaded warplanes to help them take off at steep angles from land, water or carrier. The takeoff is effected in about half the time formerly required. The current issue of Texaco Star tells how the company's technicians developed this solid fuel, sold to Aerojet Engineering Corp., manufacturer, to make jet-assisted takeoffs practicable for the Navy.

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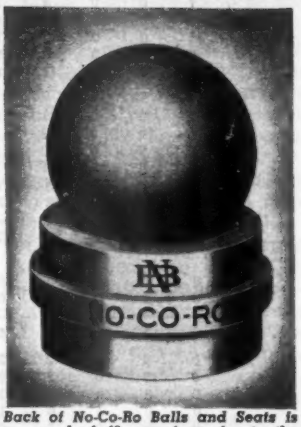

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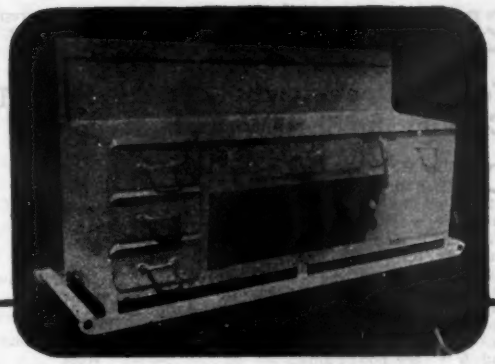

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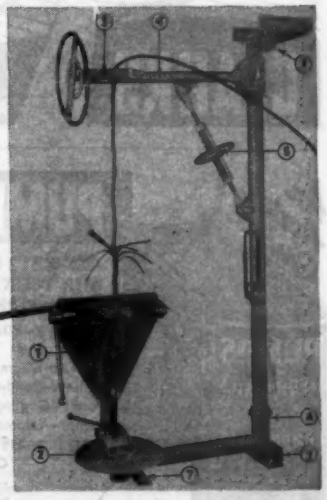

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CANADIAN FIELDS

Testing Operations Continue on Shell Well

CHATHAM. — Testing operations are still in progress at Shell Exploration 4-24-J on the Jumping Pound structure 30 miles west of Calgary. Bottoming in Madison limestone at 9,947 ft., the well on early tests with back pressure varying from 100 to 300 lb. gave 5,500,000 cu. ft. of gas and 40 to 50 bbl. of 48° naphtha and about 7 bbl. drilling mud. The wet gas flow increased to 6,400,000 cu. ft. Acid treatment has been given and tests are continuing.

Highwood.—On the Highwood structure, southwest of Turner Valley, Transcontinental 1, LSD 4, 36-18-3w5, with Madison at 3,030-3,333 ft., is testing upper porous horizon.

Conrad.—In the Conrad field, southern Alberta, Conrad-Province 55-21-B, LSD 11, 21-5-15w4, is being abandoned at 3,491 ft. Conrad-Province 55-33-B, LSD 11, 33-5-15w4, bottoming at 3,234 ft., is testing below 3,080 ft.

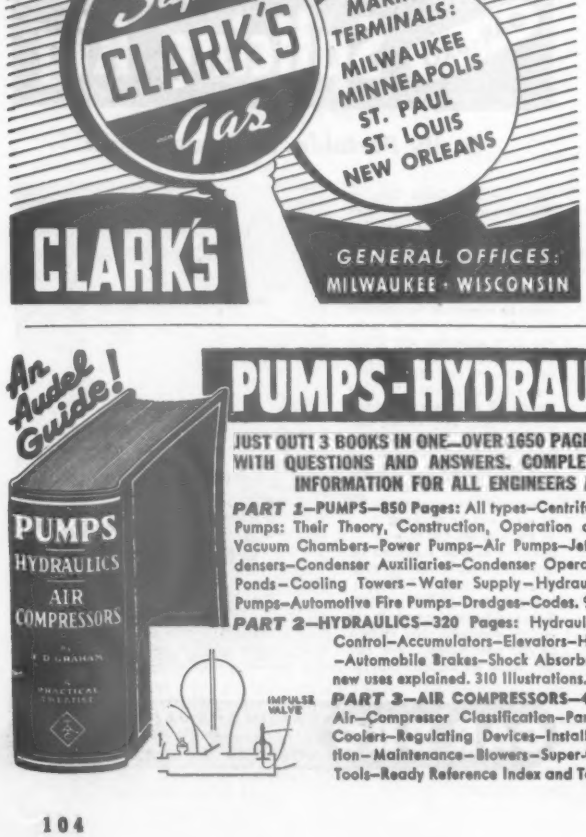
Legend.—In the Legend area, southern Alberta, Legend-Province 3, LSD 13, 23-7-13w4, has been abandoned at 3,286 ft.

Taber.—In the Taber field, Taber-Province 87-15-A, LSD 13, 15-9-17w4, finished at 3,295 ft., is pumping 77 bbl. daily initial production.

Vermilion.—In the south end of the Vermilion field, Vermilion Consolidated 15 deep test, LSD 6, 12-49-6w4, has finished in Devonian limestone at 4,031 ft. and is preparing for production test. Sweetgrass 2, LSD 3, 29-50-5w4, deepened to 1,799.5 ft., is testing, with indications of a good producer.

WILDCAT COMPLETIONS AND DISCOVERIES

	Week ended Dec. 30, 1944					Cumulative total 1944				
	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ohio	0	0	1	1	2	2	0	21	69	92
Indiana	0	0	0	1	1	4	0	0	28	32
Illinois	1	0	0	3	4	45	0	1	344	390
Kentucky	1	0	0	2	3	19	0	0	89	108
Michigan	0	0	0	0	0	13	0	4	249	266
Kansas	1	0	0	8	9	51	0	10	450	511
Neb., Mo., Iowa	0	0	0	0	0	1	0	1	18	20
Oklahoma	0	0	1	7	8	75	1	22	279	377
Texas:										
North Central	2	0	0	11	13	71	0	1	338	410
West	0	0	0	3	3	41	0	3	176	220
Panhandle	0	0	0	0	0	0	0	3	10	13
Eastern	1	0	0	1	2	7	0	5	120	132
Gulf Coast	1	0	0	6	7	37	12	16	232	297
Southwest	0	0	0	2	2	23	4	16	229	272
Total Texas	4	0	0	23	27	179	16	44	1,105	1,344
Louisiana:										
Northern	0	1	0	5	6	7	3	2	64	76
Southern	0	0	0	0	0	10	6	1	45	62
Total Louisiana	0	1	0	5	6	17	9	3	109	138
Arkansas	0	0	0	2	2	2	1	0	59	62
Mississippi	0	0	0	3	3	5	0	0	71	76
Ala., Ga., Florida	0	0	0	1	1	2	0	0	33	35
Montana	0	0	1	0	1	5	0	5	52	62
Wyoming	0	0	0	0	0	23	0	2	28	53
Colorado-Utah	2	0	0	1	3	6	0	1	29	36
New Mexico	0	0	0	4	4	9	0	3	63	75
California	0	0	0	4	4	7	0	10	185	202
Total United States	9	1	3	65	78	469	27	127	3,260	3,879
Total previous week	12	0	2	47	61					



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Progress of LPG Industry in 1944

(Continued from page 40)

tors of natural and manufactured gas will look with a more kindly eye on LPG as a means of building loads in growing communities pending the development of a market dense enough to lay city gas mains. They see in LPG a means of better meeting the competition of electricity.

As a result of the war emergency, distributors in the South where LPG is used for space heating as well as cooking, water heating and refrigeration, are becoming increasingly aware of the burden thrown on the industry by peak winter loads. Before the war, filling during the summer of new domestic consumer tanks tended to level out the demand curve to some extent but now, with new installations a minor factor, the industry sees more clearly the effect of peak demands running three to five times as great in the December-February period as in the summer.

The peak winter demand of southern domestic customers makes a considerable volume of storage essential. If the storage is to be at the refinery or gasoline plant to take care of winter peaks it will be necessary also to have a large standby fleet of tank cars to move the stored product to distributors. The distributor in turn will require excess trucking capacity in the winter which will be idle many months of the year. If storage is provided at distributor bulk plants it will be possible to maintain a tank-car fleet of reasonable proportions which can be kept busy through the year but the distributor still will be faced with the maintenance of excess truck capacity. It is becoming clear to southern distributors that the answer lies in enough storage on the consumer's premises to carry them through 45 to 60 days of the winter heating season.

The LPG industry has shown a more cooperative spirit during the past year than ever before. Necessity for group study of the acute problems arising from the war has been at least partly responsible. The L.P.G.A. has been more active than ever before. A fine example of cooperative work has been the educational program sponsored by the association. At the time of the Cleveland liquid-natural-gas disaster the publicity firm employed by the association was on the ground within a few hours. Interviews were published in the newspapers pointing out that the liquid natural gas which had caused the Cleveland fire and the conditions under which it was stored, were entirely different from butane and propane sold as LPG. This quick work undoubtedly prevented unjustifiable fears on the part of thousands of the industry's customers.

The transportation committee of L.P.G.A. met with officials of PAW, ODT, and ICC early last year during the transportation crisis. The committee was instrumental in the conversion of 600 low-pressure cars for the movement of normal butane, butane-butenes and isobutane for war purposes so that the LPG cars commandeered for this service could be returned to their usual service. Later the committee was instrumental in having 400 new propane cars built.

Other important L.P.G.A. committees which have been active during the year include safety, technical and standards, and legislation.

Looking forward to 1945 it is clear that the industry will be operating under peak load conditions as long as the global war continues. All elements in the industry will find it essential to keep load-building installations at an absolute minimum. When the German war is over the expected cancellation of war contracts should ease the supply and transportation situation on propane but not on butane. Butane is expected to be scarce until Japan is beaten—relatively scarce for a considerable period.

The LPG industry is proud of the record it has made in the service of our country since Pearl Harbor. Manufacturing plants have been built and put in operation to provide vast quantities of raw materials for aviation gasoline and synthetic-rubber components. Transportation facilities have been made available for interplant movement of war-product components. Utilities and munitions manufacturers have been supplied without interruption despite the diversion of tank cars to other services. This record has been achieved only through extraordinary efforts on the part of all elements in the industry.

TABLE 1—MARKETED PRODUCTION OF LIQUEFIED PETROLEUM GAS

	Total sales		Distribution (gallons per year)							
Year—	Gallons per year	Per cent increase over previous year	Domestic	Per cent increase over previous year	Industrial and miscellaneous	Per cent inc. over previous year	Gas manufacturing	Per cent increase over previous year	Chemical manufacturing	Per cent inc. over previous year
1922	222,641	....	.....	....	.....	....	.....	....	.....	....
1923	276,863	24.4	.....	....	.....	....	.....	....	.....	....
1924	376,488	36.0	Sale of liquefied petroleum gas			....	.....	....	.....	....
1925	403,674	7.2	confined primarily to bottled			....	.....	....	.....	....
1926	465,085	15.2	gas business prior to 1928			....	.....	....	.....	....
1927	1,091,005	134.6	.....	....	.....	....	.....	....	.....	....
1928	4,522,899	314.6	2,600,000	....	400,000	....	1,500,000	....	.....	....
1929	9,930,964	119.6	5,900,000	126.9	1,500,000	275.0	2,500,000	66.7	.....	....
1930	18,017,347	81.4	11,800,000	100.0	2,200,000	46.7	4,000,000	60.0	.....	....
1931	28,769,576	59.7	15,294,648	29.6	7,171,686	226.0	6,303,242	57.6	.....	....
1932	34,114,767	18.6	16,244,103	6.2	8,167,194	13.9	9,703,470	53.9	.....	....
1933	38,931,008	14.1	16,625,588	2.3	13,987,095	71.3	8,318,325	—14.3	.....	....
1934	56,427,000	44.9	17,681,000	6.3	32,448,000	132.0	6,298,000	—24.3	.....	....
1935	76,855,000	36.2	21,380,000	20.9	47,894,000	47.6	7,581,000	20.4	.....	....
1936	106,652,000	38.8	30,014,000	40.4	67,267,000	40.4	9,371,000	23.6	.....	....
1937	141,400,000	32.6	40,823,000	36.0	62,610,000	(*)	11,175,000	19.3	26,792,000	....
1938	165,201,000	16.8	57,832,000	41.7	62,694,000	0.0	12,386,000	10.8	32,299,000	20.1
1939	233,580,000	35.3	87,530,000	51.4	93,723,000	49.4	15,435,000	24.6	26,892,000	16.7
1940	313,456,000	40.2	134,018,000	53.1	124,482,000	34.5	20,285,000	31.4	34,671,000	29.0
1941	462,852,000	47.7	220,722,000	64.7	172,669,000	38.6	25,255,000	24.5	44,206,000	27.5
1942	585,440,000	26.5	299,559,000	35.7	201,477,000	16.7	31,366,000	24.2	53,038,000	20.0
1943	675,233,000	15.3	339,380,000	13.3	242,978,000	20.6	37,519,000	19.6	55,356,000	4.4
1944	785,000,000	16.2	392,000,000	15.5	287,000,000	18.1	46,000,000	22.6	60,000,000	8.4

*Not comparable due to segration of chemical manufacturing.

Remarks: In the above table "Total Sales" for all years except 1944 were obtained from U. S. Bureau of Mines reports. "Distribution" for the years 1931 to 1943, inclusive, was obtained from the same source. All other volumes are estimated by the writer. The total sales volume includes all liquefied petroleum gases (propane, butane, and propane-butane mixtures) when sold as such. It includes the sale of pentane when sold for any purpose other than motor-fuel blending. It does not include butane when blended with heavier petroleum fractions for motor-fuel purposes. Intercompany sales transactions such as purchases of liquefied petroleum gases by one company from other companies and then resold as liquefied petroleum gases, have been eliminated in order to avoid duplication of sales figures. The data do not reflect sales of liquefied petroleum gases used directly by the producer at the point of production, for fuel, polymerization, solvent dewaxing, etc. Neither do the figures include sales of hydrocarbons to plants manufacturing synthetic rubber or aviation gasoline or their components.

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Among the Drilling Contractors

Mercury Drilling Co. has the contract for the Sohio Petroleum Co. 1 J. F. Messenbaugh, SW NW 30-15n-4w, in the West Edmond field, Logan County, Oklahoma.

Boyd Troop is the drilling contractor on the Cities Service Oil Co. 37 Trosper Park, in SE SW NW 12-11n-3w, in the Oklahoma City field, which was shut down at 1,300 ft. It is a test to the Pawhuska.

Loffland Brothers Co., contractors on the Cities Service Oil Co. 1 Lawson, in C SW NW 22-5n-4w, McClain County, Oklahoma, north of Lindsay, was drilling below 1,100 ft. on a deep contract.

Mealy-Wolfe Drilling Co. and Fred T. Haddock were moving in rotary tools to the 2 McClung, in SW SE NE 11-8n-7e, Seminole County, Oklahoma, in the Wewoka Lake pool.

Merrill Drilling Co., of Mount Pleasant, Mich., announces that Percy L. Prout, of Detroit, geologist and accountant, has joined the company and will be in charge of the geological and land department. Prout has been associated with war-defense work for the past 2 years.

Lupher Drilling Co., Mount Pleasant, Mich., is reported to have sold one of its rotary rigs for shipment to Bolivia.

Howard Drilling Co. is the name of a new firm for which a certificate of limited partnership has been filed in Los Angeles County, California, by Chester I. Garlinger, J. Walter Van Atta, and Gordon Hegardt.

Robert W. Atha has been awarded drilling contract on the Louis Rose 1 Lyle Dickinson, in NE SE SE 22-8n-6w, Ionia County, Michigan.

A. S. Cochran will drill the Michigan Consolidated Gas Co. 1 Louis D. Phillips et al, in NW NW SE 3-10n-10w, Kent County, Michigan.

Gus Pongratz, California drilling contractor, was recently awarded contract to drill a well for Macoil Co. in the South Mountain field and, with preliminary operations already under way, should be ready to spud about January 10.

Neil Berston is the drilling contractor for the Guy E. Dodge 1 Lee L. Woodward, in SW NW NE 8-8n-9e, Lapeer County, Michigan.

Muskegon Development Co. is the contractor on the Skelly Oil Co. 1 Joe VanderLeest, in SW SW SW 28-14n-15w, Oceana County, Michigan.

Cinnabar Drilling & Exploration Co., Los Angeles, has been organized in California to engage in contract drilling and is at present engaged in a joint operation with Hilo Oil Co. on a wildcat well southeast of Whittier field. Arthur C. Fisher is president and Vine H. Howe is vice president. H. P. Dean is secretary-treasurer.

Goll, Graves & Mechling is the drilling contractor for the Basin Oil Co. and Don Rayburn 1 State-Deep River, in SE SE SE 6-19n-4e, Arenac County, Michigan.

Kerlyn Oil Co. has been awarded drilling contract for another Wilcox sand test in the Lexington area of southern Cleveland County, Oklahoma, the location to be in 19-6n-1e, probably in the northwest quarter.

LET ME SHOW YOU WHAT GOOD WATER CONDITIONING SERVICE REALLY IS!

Call JOHN FIELD-MAN ON YOUR NEXT WATER CONDITIONING JOB

LELAND HAMNER CO.

LELAND HAMNER CO.
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For Month In - Month Out Service
USE MacCLATCHIE
"AIRFLOTE"
MUD PUMP VALVES

Because of the sealed-in air chamber that increases buoyancy . . . cuts liquid slippage . . . reduces impact . . . and gives more efficient valve action, MacClatchie "Airflote" Pump Valves insure superior performance and longer life under the toughest pumping conditions. Replaceable bodies, reversible inserts and everlasting stem caps give true MacClatchie economy.

The valve seats for "Airflotes" (interchangeable with MacClatchie "Streamlined" Valves) have 20% to 100% more striking surface than others. Plus patented cross-bar construction.

All MacClatchie Valves are guaranteed against cutting out the pump. See your nearest representative or write direct for details on this guarantee!

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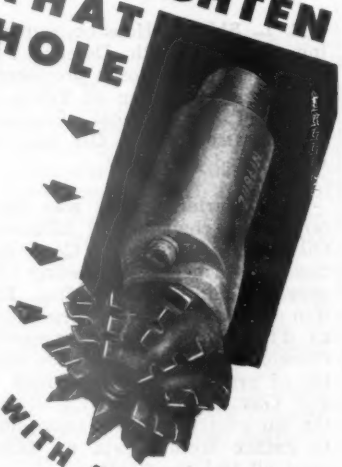
MOUNTAIN SALES & SERVICE CO.,
Casper, Wyoming
Foreign:
GEORGE R. WOODS, 17 Battery Place,
New York, N. Y.

STRAIGHTEN THAT HOLE



WITH A ZUBLIN SIMPLEX BIT

EIGHT interchangeable cutters of heat treated and hard surfaced steel. For drilling through cement, collapsed casings and variable formations and straight holes.

See Composite Catalog or Bulletin and information upon request.

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2369 EAST 51st ST. • LOS ANGELES 11, CALIFORNIA
BRANCHES: HOUSTON, TEXAS • LAKE CHARLES, LA.
BAKERSFIELD, VENTURA AND AVENAL, CALIFORNIA

Major portion of the block is held by Anderson-Prichard Oil Corp., with Phillips Petroleum Co. and Kerlyn being on the structure. Deal was made among these companies.

Dave Wilson, as contractor, will drill the Fell & Reid 1 Fred Klam, in SE SE SE 19-51n-32w, Platte County, Missouri, test northeast of Parkville.

Regent Drilling Co. of Calgary, Alta., has finished Sweetgrass 2, LSD 3, 20-50-5w4, in the Vermilion field, eastern Alberta, and is testing production.

Charles Mills, of Lloydminster, Sask., will drill Community Services 1, LSD 12, 24-49-28w3, in the Saskatchewan portion of the Lloydminster field. The well is planned to develop a gas supply for Community Services, which intends to market the product to North Battleford, Saskatoon and other communities.

Get Overtime Pay, Whether Well Is Dry or Not

SAN FRANCISCO.—Oil-well drillers, if they work overtime, must be paid overtime wages under the Fair Labor Standards Act, regardless of whether the well is dry or a producer, according to U. S. Circuit Court of Appeals, which last week reversed a decision of Judge Peirson M. Hall, of Los Angeles.

Judge Hall had ruled that the act did not apply in the case of a dry well, because interstate commerce was not involved, inasmuch as no oil was produced. The Circuit Court took a broader view, holding that drilling is a part of production, and there was no way of knowing whether the well would or would not be a producer.

CALENDAR

January 1945

S.A.E. meeting, Book-Cadillac Hotel, Detroit, January 8-12.

April 1945

American Gas Association, annual conferences of technical section, Stevens Hotel, Chicago, April 4-6.

Midwest Power Conference, eighth annual meeting, Palmer House, Chicago, April 9 and 10.

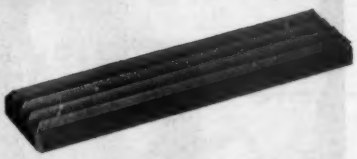
I.P.A.A., midyear directors meeting, New Orleans, La., April 9, 10 and 11.

October 1945

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 4-6.

I.P.A.A., annual membership meeting, convention city to be selected later, October 15, 16 and 17.

WEB WILSON
Tong Dies



The ORIGINAL vertical toothed tong die, designed and marketed by us for over six years, has proved its superiority. It penetrates hard tool joints, wears longer, is reversible and can't be put in backwards.

SEE COMPOSITE CATALOG
PAGES 3101 TO 3120

WEB WILSON
Oil Tools
W. W. WILSON BUILDING
HUNTINGTON PARK, CALIF.

PENBERTHY
"REFLEX"
WATER GAGE SET

For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PERSONALS

Knows Refinery Jobs, for He Did Them

GEORGE R. LORD, advanced last November from general manager of refineries to vice president of Sinclair Refining Co., has had the sort of diversified experience that gives a man intimate knowledge of all phases of the refining industry. After graduating from Marietta College (he had worked during vacations for Eureka Pipe Line Co.) he took a graduate course in chemistry at Massachusetts Institute of Technology. Then he went to work in the laboratory of Magnolia Petroleum Co. at Corsicana, Tex. Shifted to the operating department, where he gaged tanks, ran stills and treated oils, he became familiar with every operation of the plant.

By 1919—he then was 32—Lord had risen to general superintendent of Magnolia's Beaumont, Tex., refinery. In that year he resigned to become superintendent of Sinclair's East Chicago plant. Two years later he was made assistant manager of refineries, with headquarters in Chicago. In 1930 he was appointed general manager, with offices in New York.

Lord likes a game of golf and says he always could break 100 if it were not for a few bad holes. He makes a good score at bowling, too, and he is an enthusiastic stamp collector.

Robert E. Kilpatrick, district petroleum engineer for Humble Oil & Refining Co., has been transferred from the Raccoon Bend district, Bellville, Tex., to the Katy, Tex., district. **John S. Boldrick,** a member of the company's engineering staff, has been promoted to division petroleum engineer of the Louisiana division, with headquarters in New Orleans. **William E. Kirkham** has been appointed district chief clerk of the Talco, Tex., district.

Roy Bell, of Neale & Massey, from Trinidad; **Lt. Warren Sorrels,** U. S. Engineers, formerly with Creole Petroleum Corp.; **Lt. Col. E. M. Donovan,** U. S. Army, formerly with Burmah Oil Co.; **Dr. W. Y. Lee,** independent oil operator from China; **A. F. Michel,** Drilling & Exploration Co., Inc., from Venezuela; **L. A. Thomas,** from Trinidad; **Charles Lamarr,** formerly with U.B.O.T.; **Don B. Grable,** formerly in Argentina; **H. E. Johnson,** Drilling & Exploration Co., Inc., from Brazil; **L. W. Wiedey,** Tropical Oil Co., from Colombia; **Willard Goodwin,** Arabian American Oil Co.; **Paul H. Molidor,** Socony-Vacuum Oil Co. de Colombia, and **M. H. Bush,** of American Overseas Petroleum Co., Egypt, were among guests at the recent dinner meeting of the Los Angeles chapter of Nomads.

Sam P. Robinson, recent addition to the staff of the chemical products department of Phillips Petroleum Co., Bartlesville, Okla., is a graduate of Massachusetts Institute of Technology School of Chemical Engineering Practice. Robinson has held supervisory jobs in both production and development with a number of industrial concerns.

D. A. Hulcey, Dallas, president of Lone Star Gas Co., has been chosen president of the War Chest of Dallas County. The chest's receipts in 1944 totaled $2,143,521.

Joseph Clare, with W. C. McBride, Inc., at Evansville, was elected president of Indiana Oil Scouts Association for 1945.

J. R. Gordon, safety engineer for Lion Oil Refining Co., El Dorado, Ark., was named chairman of South Arkansas Accident and Fire Prevention Club, a recently formed safety organization.

Kenneth Lyons, formerly scout at San Angelo for American Republics Corp., is now in charge of a new district office which the company opened in Shreveport on January 1. **J. W. Wingfield,** who worked out of the company's headquarters in Houston as engineer on a gravitymeter crew, has been transferred to the land and scouting department in San Angelo.

Robert Terry, president Blue Flame Oil Co., was elected president of Detroit Oil Men's Club at the annual meeting. **Howard E. Johnson,** manager Red Indian Oil Co., was chosen vice president; **Le Roi P. Buzette,** general manager Sucher Brothers, Inc., secretary; **Harry Victor,** vice president Victor Oil Co., treasurer.

Allen Ehlers, The Carter Oil Co., was elected president of Shawnee (Okla.) Geological Society at a recent meeting. **John P. Lukens,** Oklahoma Seismograph Co., was chosen vice president.

Deering J. Marshall, Wichita, Kans., has sold his interest in Black-Marshall Oil Co. to other stockholders. He and **W. H. Black** organized the company in 1939, with Great Bend, Kans., as its headquarters.

C. L. Shirley, Houston, supervising engineer with Defense Plant Corp., has been chosen president of San Jacinto chapter of Texas Society of Professional Engineers. **M. Albertson,** Shell Oil Co., Inc., was elected a director.

D. V. Carter, Dallas, was chosen temporary chairman of Mississippi Oil and Gas Engineering Committee, recently formed at a meeting of 60 operators in Jackson, Miss. Election of **Alec M. Crowell,** Shreveport, as director was recommended. Crowell recently resigned as director of production for Arkansas Oil and Gas Commission. Carter said the purpose of the organization is to gather factual data on Mississippi oil and gas fields.

C. L. Adams, formerly assistant manager of General Petroleum Corp.'s laboratories, in Los Angeles, became manager January 1, succeeding **C. F. Olsen, Sr.,** retired. **J. A. Boege** was named general superintendent of laboratories, reporting directly to Adams.

A. C. Glassell, Shreveport oil operator and sportsman, has been awarded the cup given annually by Forest

and Stream, national sportsmen's magazine, for conspicuous conservation achievements. Earlier in the year Glassell was chosen president of Ducks Unlimited. Forest and Stream cited him for his "wonderful work for Ducks Unlimited and waterfowl conservation."

W. D. Henderson, formerly district geologist for Stanolind Oil & Gas Co. in West Texas and New Mexico, has been transferred from Midland, Tex., to Fort Worth, where he is now division geologist. He succeeds **Foster J. Schempf,** who will supervise exploratory operations in the Gulf Coast area.

Lt. Comdr. Carl L. Estes, formerly active in East Texas oil operations, has left the Willow Grove, Pa., naval air station for sea duty.

James Gibbs is in charge of North Texas geological offices which Standard Oil Co. of Texas, with headquarters in Houston, has opened in Wichita Falls. **Robert Drake,** formerly with Bridwell Oil Co., is Gibbs's assistant. The company is the producing subsidiary of Standard Oil Co. of California.

N. W. Muller has resigned as design engineer at the Whiting, Ind., refinery of Standard Oil Co. of Indiana to join the staff of Institute of Gas Technology, Chicago. He will work on development of applications of the institute's new pulverizer.

J. A. Miller, formerly advertising-sales promotion manager for Esso Marketers, New York, has been appointed to the newly created position of coordinating the domestic and foreign advertising and sales promotion activities of Standard Oil Co. (New Jersey). **R. M. Gray,** who was assistant manager of advertising-sales promotion, has been named to head that department.

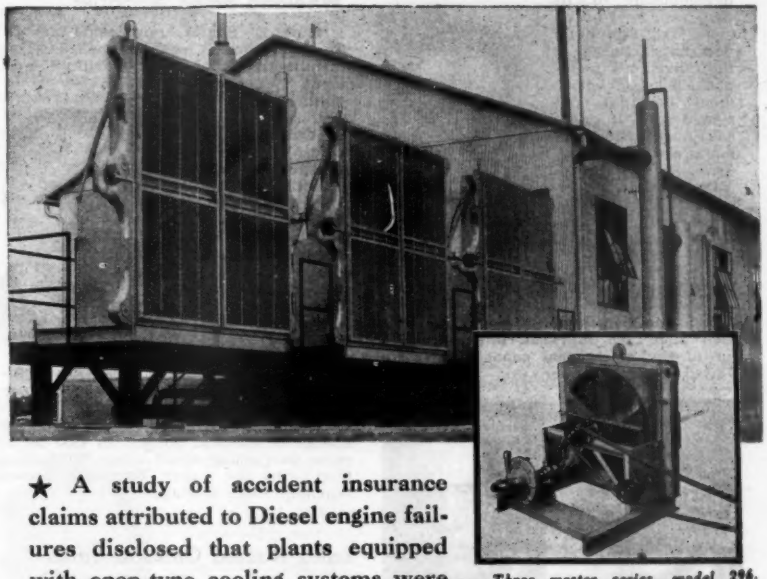
W. W. Wells, secretary of the product conservation committee of Petroleum Industry War Council and promotion manager of the industry's campaign against the black market, has resigned to resume business in the advertising and public-relations field.

Ralph B. Lloyd, president of Lloyd Corp., Ltd., was reelected president of California Oil and Gas Association.

G. F. Gephart, formerly assistant comptroller of Standard Oil Co. of California, has been appointed comptroller, succeeding **B. W. Letcher,** who is a vice president and the secretary of the company at the San Francisco office.

INSURANCE REDUCED 40%

WITH CLOSED-TYPE COOLING SYSTEMS



★ A study of accident insurance claims attributed to Diesel engine failures disclosed that plants equipped with open-type cooling systems were the principal offenders. As a result, insurance for engines with closed-type systems became available at a 40% lower premium.*

Three master series, model 296, "Full-Flow" Coolers (top photo) serving three 400 hp engine-generator units — for both jacket water, and oil to water heat exchangers in the lube oil system. Standard series, model 32 "Full-Flow" Cooler (inset) showing fan, pump and idler arrangement.

Young radiator-type units offer all the features for most efficient operation of closed-type cooling systems. Engine temperatures are more easily controlled for efficient operation and added engine life. Make-up water requirements are negligible. Jacket water can be treated with Young inhibitor to neutralize chemical impurities that cause corrosion and eventually retard circulation.

Let Young heat transfer engineers help you cut costs with a cooling system your Diesel insurance engineer approves . . . Write for Catalog Number 13638.

*Stated in Diesel Power, February 1944 — "Diesel Engine Insurance."

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BUY BONDS • PRODUCE MORE • SALVAGE SCRAP • WIN THE WAR

HEAT TRANSFER ENGINEERS

Manufacturers of Oil Coolers • Gas, Gasoline, Diesel Engine Cooling Radiators • Intercoolers • Heat Exchangers • Engine Jacket Water Coolers • Unit Heaters • Convectors • Condensers • Evaporators • Air Conditioning Units • Heating Coils • Cooling Coils • and a complete line of Heat Transfer Equipment for aircraft.

YOUNG RADIATOR CO., DEPT. 225-A, RACINE, WIS., U. S. A.

DISTRIBUTORS: The Happy Co., Tulsa, Oklahoma — A. R. Flournoy, Bell (Los Angeles), California
Wrightson-Campion, New York, N. Y. — W. P. Nevins Co., Chicago, Illinois — C. H. Bull, San Francisco, California
EXPORT: Ameresco, Inc., New York, N. Y.

Equipment Men in the News

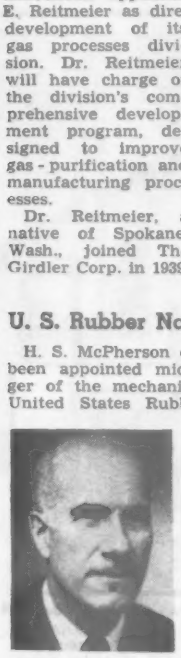
Reitmeier Joins Girdler As Research Director

The Girdler Corp., Louisville, Ky., has announced appointment of Dr. Ronald E. Reitmeier as director of research and development of its gas processes division. Dr. Reitmeier will have charge of the division's comprehensive development program, designed to improve gas-purification and manufacturing processes.

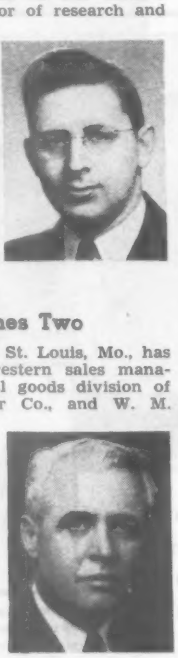
Dr. Reitmeier, a native of Spokane, Wash., joined The Girdler Corp. in 1939.

U. S. Rubber Names Two

H. S. McPherson of St. Louis, Mo., has been appointed midwestern sales manager of the mechanical goods division of United States Rubber Co., and W. M. Ballew of Kansas City, Mo., has been shifted to the post of southwestern sales manager.



H. S. McPHERSON



W. M. BALLEW

Ballew will be responsible for mechanical-goods sales in branch offices in Kansas City, Tulsa, Denver, Houston, Dallas, New Orleans, Omaha and Minneapolis.

Security Engineering Co., Inc. Acquires Crum-Brainard Co.

Sale of Crum-Brainard Co., 217 Magnolia Avenue, Whittier, Calif., to Security Engineering Co., Inc., 108 West Whittier Blvd., Whittier, has been announced by the board of directors of the latter company.

W. E. SIEVERS

This modern plant manufactures roller bits and other oil-tool items, and although the corporation shall remain under its original name, its products shall be sold internationally and serviced by Security, according to W. E. Sievers, Security's executive vice president.

Control of Crum-Brainard affairs will now be vested in a board of directors composed of: J. D. Sievers, chairman; W. E. Sievers, president; O. Hammer, vice president; M. H. Lockett, secretary-trasurer, and Oscar A. Trippett, assistant secretary.

R. M. Cook, Security's general sales manager, will become a vice president of Crum-Brainard. The two plants will be operated as separate units, and no changes in personnel are contemplated.

R. S. Shafer Is Wheland Sales Manager

Ralph E. Shafer, purchasing agent of The Wheland Co., Chatanooga, Tenn., manufacturers of rotary-drilling equipment, has been appointed sales manager, it is announced by Charles W. Wheland, vice president and general manager of the company. Shafer succeeds Arch C. Willingham, who recently retired and moved to Florida.

R. E. SHAFER

Beginning as a stenographer in 1913, Shafer advanced to the sales department as a sawmill equipment salesman until 1928. At that time Wheland took over the pump line of Lucey Manufacturing Co. and Shafer took charge of oil-field pumps. In 1935 he became purchasing agent when Willingham, then with the Lucey company, became Wheland sales manager.

Laird Named Chiksan Sales Manager and Vice President

Lee J. Laird, formerly assistant sales manager and recently in charge of production control, has been appointed sales manager and vice president of Chiksan Tool Co., Brea, Calif.

Lee Laird's experience during 10 years as a member of the Chiksan organization fully qualifies him for his new responsibilities. Under his direction, extensive plans are under way to develop many new applications for Chiksan ball-bearing swivels as well as new types of swing joints which will greatly enlarge the company's market.

Allen Becomes Sales Manager

Kerotest Manufacturing Co., Pittsburgh, Pa., announces the appointment of George R. Allen as general sales manager of the Brass Division.

Stone & Webster Announces Executive Changes

The board of directors of Stone & Webster Engineering Corp. at its meeting held on December 20 elected Russell T. Branch president of the corporation to succeed John R. Lotz, who was elected chairman of the board after serving 8 years as president. Branch's election follows more than 30 years of service during which period he has been successively superintendent of construction, construction manager, vice president and senior construction manager, and executive vice president. Lotz will continue to have an active part in the affairs of the corporation.

The board of directors also announces the election of Emmart LaCrosse as vice chairman of the board, Joseph Pope as first vice president, and Karl Finsterbusch, H. E. Brailey, R. E. Argersinger and H. L. Bunce, Jr., as vice presidents.

McCreary, New President of Goetze Gasket & Packing Co., Inc.

At a recent meeting of the board of directors, Kenneth McCreary was elected president of Goetze Gasket & Packing Co., Inc., New Brunswick, N. J. McCreary, who has been associated with this company since 1932, has served consecutively as assistant to the president, treasurer and vice president and treasurer. He succeeds Frederick Goetze, who died on January 30, 1944.

Canco Announces New Appointment

H. M. McCormack has been appointed assistant general manager of sales of American Can Co. He will have supervision of sales activities throughout the country in connection with fiber milk containers and cans for beer, and will be in charge of Canadian sales affairs at the general office in New York.

McCormack has been with the company for 28 years, and in the sales department for 26 years.

Buffalo Bolt Co. Purchases S. M. Jones Co.

The S. M. Jones Co., manufacturers of sucker rods and related products, has been purchased by Buffalo Bolt Co., it is announced by Rudolph B. Fiershem, president of the Buffalo firm.

The large Jones plant at Toledo, Ohio, will be operated as a separate unit without change in name, products, policies or personnel.

Paul H. Jones will continue his position as president of the Jones concern, with his brother, Mason B. Jones, retaining his position as vice president and general manager. D. R. Dale, chief engineer and director of research, will continue with the company and L. J. Pundt will continue as sales manager.

Founded in 1892 by the late Samuel M. Jones, inventor of the all-metal sucker rod, the Jones company has been marketing sucker rods for 53 years. Buffalo Bolt Co. has operated continuously since 1855.

Firm Changes Name

On January 1, The Oil Well Improvements Co., Tulsa, Okla., changed its name to Orbit Valve Co. Managements, products, and policy will remain unchanged.

New Office for Core Laboratories

Core Laboratories, Inc., Dallas, Tex., announce the opening of a new division office in Jackson, Miss. The new office is located in the John Hart Building, with Ralph W. Parnell, division engineer, in charge. This is the ninth division office in operation, and additional offices will be announced later.

Name Consolidation Announced

Effective January 1, Portland Cordage Co., Portland, Ore., and Seattle, Wash., and Tubbs Cordage Co., with head office

in San Francisco, Calif., began operating under the one name of Tubbs Cordage Co. The consolidation in no way affects the personnel of the various offices in Los Angeles, San Francisco, Portland, Seattle, Chicago and New York, nor will there be any changes in distributor setup.

A. R. Thomson Joins Holser Agency

A. R. Thomson, formerly director of training for R. G. LeTourneau, Inc., has become associated with Lyle Hosler Advertising Agency in Peoria, Ill. "Bob" Thomson, prior to joining LeTourneau, was advertising and sales promotion manager of Schramm, Inc., manufacturers of air compressors. He went with LeTourneau in 1939 as assistant advertising manager, later organizing and becoming director of sales, service and factory training divisions.

Cuts Transposed

M. J. CONWAY

Due to a series of transpositions, several cuts on page 124 of the December 23 issue were improperly identified. The individuals involved, now properly labeled, appear below and to the left. The Oil and Gas Journal regrets this mixup.—Ed.

RUSSELL D. HEATH

DEAN SWIFT

Mason Elected Vice President

Leo J. Mason, of Gary, Ind., has been elected vice president of National Tube Co., according to Charles R. Cox, president of this U. S. Steel Corp. subsidiary. The new vice president has been associated with National Tube in various capacities since 1918.

Universal Atlas Announces Several Appointments

James M. Adams has been appointed assistant sales manager at Waco, Tex., for Universal Atlas Cement Co. Clayton H. Boice of Waco is sales manager for Universal Atlas in the Southwest.

Other appointments include H. J. Layden, district sales manager at St. Louis, Mo.; P. L. Bowlin, district sales manager at Des Moines, Iowa; and Robert E. Fulton, assistant sales manager at Philadelphia, Pa.

Retirement of S. J. Robison, chief engineer, after 37 years' service with the company, was announced by Blaine S. Smith, president. Richard A. Dittmar was named chief engineer. Raymond L. Walsh was named assistant chief engineer, all with offices in New York.

W. Scott Wilson, assistant plant manager at the Hudson, N. Y., plant, was named plant manager.

Cook Joins Wisconsin Axle

Announcement is made by B. W. Keese, chief engineer of the Wisconsin Axle division of Timken-Detroit Axle Co., of the appointment of Charles A. Cook as his assistant in charge of transmission design.

Active in automotive engineering work since 1913, Cook has been with the Fuller Manufacturing Co. for the past 16 years, and since 1934 has been chief engineer and executive engineer in charge of product design, tool design, metallurgical and experimental departments.

Prior to joining Fuller, Cook was connected with Muncie Products division of General Motors, International Harvester Truck Division, and with a number of other truck and passenger-car manufacturers.

In his new post Cook will have charge of transmission development for postwar commercial vehicles.

King Field Sales Engineer For General Controls

General Controls Co., Glendale, Calif., announces the appointment of James King as field sales engineer in the New York factory branch, 101 Park Avenue. King will serve users of automatic controls, particularly in industrial fields, throughout metropolitan New York. Recently he handled industrial oil sales for Pure Oil Co. in New York.

Georgi With Pennsylvania Salt

Edmund A. Georgi, formerly manager of technical development, papermakers chemical department, Hercules Powder Co., has joined the research and development department of Pennsylvania Salt Manufacturing Co. as director of special products division. The special products division includes laboratory and field work in evaluation of new products, and in carrying out service work requested by sales or manufacturing departments.

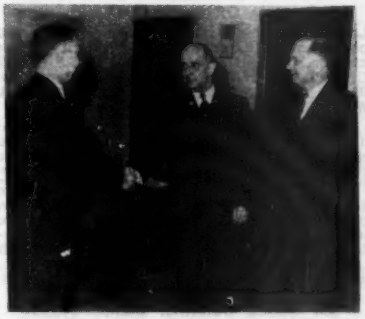
Blake Heads Wire Sales

JOHN BLAKE

In an announcement made by Howard W. Weber, general sales manager of the wire and cable division of United States Rubber Co., John Blake has been appointed manager of marine cable sales, with headquarters at 1230 Sixth Avenue, New York City. Blake started with the company during 1911 at the Bristol, R. I., plant. He left the company during 1915 to be factory superintendent of Bishop Gutta-Percha Co. This firm was dissolved during 1941 and after being associated with another wire plant he returned to Bristol as subcontracting manager.

The Happy Co. Completes 25 Years of Service

On December 31, The Happy Co. completed a quarter century of service to the petroleum industry. Paul Mahaffey, president, established the business, January 1, 1920, as The Happy Belting Co. He was soon joined by Leo King, vice president, and Roy Lindley, secretary-treasurer, and for several years the company's business was limited to the sale of rubber and leather belting for oil-country purposes.



Officers of The Happy Co., on observance of the company's 25th anniversary: Roy Lindley, secretary-treasurer; Paul Mahaffey, president, and Leo King, vice president

The Happy Belting Co. made many studies of field operations which resulted in substantial improvements in flat belting drives, and in the prevailing conditions in pumping wells. Improvements were made in the quality of the belting with reference to raw materials. Also, revolutionary advancements were made by the manufacturer, Boston Woven Hose & Rubber Co., by improving the manufacturing process, which is known as a "continuous cure of rubber belting."

In 1929 The Happy Belting Co. inaugurated the use of endless belts. The lengths originally worked out were later adopted by A.P.I.

By 1937 most oil companies began to discard the use of standard fronts and adopt the pumping unit. At that time The Happy Belting Co. entered into the manufacture of chain-driven pumping units. In that same year it also entered into the sales and promotion of engine-jacket cooling through the medium of radiator-type cooling for engines, which supplanted circulating tanks that had for many years been used for this purpose. This phase of the business has been enlarged not only to cooling engine-jacket water but also cooling oil, natural gas and hydrocarbons.

The Happy Belting Co. continually expanded by opening new branches as development took place in the various fields, and on January 1, 1942, the company changed its name from The Happy Belting Co. to The Happy Co., due to the fact that it had added additional lines of equipment.

New Blackmer Pump Co. Manager

Fred T. Kennedy has been appointed general manager of Blackmer Pump Co., Grand Rapids, Mich. Kennedy has, until recently, been connected with War Production Board in Washington, D. C., and will move to Grand Rapids early in December to assume full charge of all Blackmer operations.

Classified Advertising

LEASES AND DRILLING BLOCKS

3000 ACRES, 10 year leases, 10c rentals, in Harrison County, Indiana, 20 miles southwest of Louisville, Kentucky. Want Trenton test. Leo H. Graves, Phone 64, Farina, Illinois.

NEW MEXICO
State Oil and Gas Leases

Located in the Great San Juan Basin. Oil pools now producing highest gravity crude known. HELIUM discovery. DEEP TEST UNDER WAY. Buy where the majors buy. Write for information. Harry S. Wright. Wright Bldg., Farmington, New Mexico.

150,000 Acres scattered land in six counties, Eastern Colorado, owned in fee and clear. Want to lease for oil and gas. Write owner John W. Baughman, Liberal, Kansas.

HIGH GRADE OIL is being found along the Kentucky-Tennessee line, at shallow depths. 5 sands under 1200 feet. We have purchased a rig and have made two locations on a block on the Tennessee side with 3 structures. Geological report, maps, etc., available if interested in close-in lease plays.
W. J. DOBBS
504 Wilson Building, Dallas, Texas

WILL BUY cheap producing lease. Want one I can operate myself. Give all details, including price. Box A-360, The Oil and Gas Journal, Tulsa, Okla.

UNEXCELLED pronounced surface structure discovered by late road excavations in South Central Okla. Reverse dips all directions can only be explained as extraordinary; also shown as a closed high on Okla. Geol. Survey, in trend of and near some of ten famous oil fields all found by surface structure. Will give 3000 acres for a well to satisfactory concern regularly engaged in the Oil Business. Also have 280 acres for development offset to 2500 foot production. Write Owner, Box 572, Chickasha, Okla.

BARGAIN
Proven 320 A. Block. One producing well. Equipped. 32 gravity oil. 20 more locations around 700 feet. Also other acreage. Wells come in from 15 to 50 bbls. Price $3000.00. F. A. Hodge, Box 74, Wellsville, Kansas.

LEASE PLOCKS, near major play. From 2,000 to 15,000 acres. Will deal blocks outright or will furnish geological report and quote price on completed well. In inquiring, explain exactly what you want. Box A-317, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES
PRODUCING OR NONPRODUCING
Texas, New Mexico, Oklahoma.
Louisiana and Illinois.
Inquiries Invited
B. D. BUCKLEY
60 Broadview Drive, Clayton (5).
St. Louis, Missouri

HELP WANTED

MAJOR oil company has vacancies for Petroleum engineers for foreign and domestic service. Mechanical or petroleum engineering degree and three years experience in the oil industry required. Reply to Box 2819, Dallas 1, Texas.

MECHANICAL ENGINEER DESIGNER
Well-equipped iron and steel plant in New Orleans now manufacturing ship parts—with structural steel, machine shop, and drop forge facilities—requires experienced designer of oil-field drilling and production equipment and oil refinery equipment. One thoroughly grounded in welding fabrication, both manual and automatic, preferred. The man we want must be capable of designing a product—and following it through production. Please give details of activities over past 10 years, send small photo and advise salary expected.
George Irving Machine & Iron Works
3426-30 Short Street, New Orleans, La.

HELP WANTED

WANTED by consulting organization: Petroleum engineers with Hayward mud logging experience or its equivalent. Immediate openings in Venezuela, excellent opportunity for advancement to managerial positions throughout the world. Box A-200, The Oil and Gas Journal, Tulsa, Okla.

WANTED: A man with technical and engineering training for the Industrial Products Department of a major Oil Company in the Ohio-Michigan area. In applying give information as to educational training, practical experience, and age. Box A-332, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: MECHANICAL ENGINEER who knows something about drafting. John Zink Company, 4401 South Peoria, Tulsa, Oklahoma.

SALES ENGINEERS, preferably with chemical or mechanical background, wanted by well-known industrial instrument company looking forward to post-war expansion. Work requires persistence and ability to cooperate as consultant with prospects rather than high pressure selling. Positions open in several sections of the country. Box A-347, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED
Experienced Abstracter. Permanent place. Blaine County Abstract Co., Watonga, Oklahoma.

WANTED: Refinery Superintendent, Middle West location. State full experience, qualifications, etc. Box A-362, The Oil and Gas Journal, Tulsa, Oklahoma.

MEN FOR FOREIGN EMPLOYMENT
Limited number desirable positions open in Saudi Arabia:

Petroleum, electrical and mechanical engineers; radio operators and technicians; Diesel and tractor mechanics; air-conditioning and refrigeration mechanics; stabilizer operators; utility operators; surveyors; accountants; stenographers; typists. Employment offers splendid opportunities for post-war security and advancement. Liberal benefit plans; vacations in United States; free hospital and medical care. If genuinely interested in foreign career, send full information on experience, transcript of college record (professional applicants only), references, draft and availability status to our Relations Department.

ARABIAN AMERICAN OIL COMPANY
200 Bush Street
San Francisco 4, California

SITUATIONS WANTED

COMMERCIAL PILOT, age 37, 2600 hrs. instrument rating; C-6600 H.P. rating; One year testing B-24s; would like position with oil company. H. J. Tunstall, 3218 Wingate, Fort Worth, Texas.

YOUNG MAN, married, veteran, approx. six years Mechanical Engineering Background. Some drafting knowledge. Familiar with Technical aspects of machine shop practices and supervision. Wishes position with Oil or Steel Firm in Texas or Oklahoma. Must have postwar future. References. Box A-354, The Oil and Gas Journal, Tulsa, Okla.

COMMERCIAL PILOT wants position with company. Former B-24 test pilot and flight instructor. 2,000 hours flying time. 0-6600 horsepower rating single and multi engine; instrument rating, experienced night flying and cross-country. Age 31; draft 2B. Seven years business experience sales and executive. Go anywhere; available immediately. Reply The Oil and Gas Journal, Box A-343, Tulsa, Oklahoma.

FOREIGN service desired by man 37 years of age. At present manager of supply house for oilwell equipment manufacturer. Married, no children. Wish position of some permanency with a future. South America or Mexico preferred. Two years college education. Box A-389, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

MEXICO: College graduate in law [illegible] now 45 years old, desires to locate in Mexico City because of climate and representing manufacturers of oil field supplies or oil on a drawing account commission basis. Experience eight years on Wall Street, New York, and nine years as independent oil producer in Louisiana, Arkansas, [illegible] Illinois. Box A-229, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM and Chemical Engineer available. Nineteen years experience; Natural Gasoline, Recycling and Refining work; Chief-Chemist; Chief-Operator; Stillman; Alkylation and Isomerization; Engineering work on topping and cracking units; Process Engineer. Box A-301, The Oil and Gas Journal, Tulsa, Okla.

INSTRUMENT ENGINEER, with thorough knowledge of oil refinery process control and experience in specifying controls for oil refineries wants to make connection with oil refinery, chemical plant, or engineering construction company. Have had several years experience as instrument supervisor of oil refinery. Age 34. Box A-345, The Oil and Gas Journal, Tulsa, Oklahoma.

INSTRUMENT Maintenance Supervisor. Eleven years instrument maintenance and engineering experience in chemical plant and petroleum refinery. Age 34. Graduate M. E. Box A-246, The Oil and Gas Journal, Tulsa, Okla.

SUPERINTENDENT Production. 17 years experience in development and oil production including gas repressuring and water flooding. Engineering training and experience. Familiar with rotary and cable tool operation and remedial work on wells. Desire position in Mid-Continent. Age 35. Available 1-1-45. Box A-319, The Oil and Gas Journal, Tulsa, Oklahoma.

DO YOU NEED a capable production man? I am experienced in rotary drilling, clean-out work, repressuring, and oil production. University graduate, draft exempt. Box A-350, The Oil and Gas Journal, Tulsa, Okla.

SUPERINTENDENT—Years of experience in production supervision, sober, reliable. Can make your property produce profits possible from efficient operation. Reference. Box A-353, The Oil and Gas Journal, Tulsa, Okla.

RIVER TRANSPORTATION man of wide experience desires position as superintendent or Assistant or river transportation department. Now employed by Major company. Can furnish A-1 references from present and past employers. Write Box A-[illegible] The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Petroleum Engineer; draft exempt. Experienced in drilling and production. Prefers sales engineering position with equipment company or connection with independent operator. Will consider foreign employment. Box A-368, The Oil and Gas Journal, Tulsa, Okla.

PRODUCTION DEPT.: Experienced in production and drilling operations. Will join aggressive company in any capacity from field foreman to general superintendent. Box A-361, The Oil and Gas Journal, Tulsa, Oklahoma.

PHYSICIST: A.B., two years graduate study, eight years geophysical and petroleum chemical research. Supervisory experience. Present salary $4300. Age 31, married, family, 2-A. Must be inland location. Box A-367, The Oil and Gas Journal, Tulsa, Oklahoma.

LAND MAN, leasing, blocking, expert title work available to go anywhere, best references, wants connection with oil company. Box A-366, The Oil and Gas Journal, Tulsa, Oklahoma.

TWENTY years, experience in operation, topping, cracking, gas compression and recovery, light ends fractionation, light and heavy treating. Have statement of availability. South or west. Box A-365, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM CHEMIST, M.S. Degree in organic Chemistry. Twelve years' experience in research development and plant production on lubricating oils, petrolatums, waxes and related products. Reply Box A-364, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM TECHNOLOGIST
College education. Wide refinery experience. operations, maintenance, construction, design. Also general organization and safety. Desires position U.S.A. or overseas. Box A-363, The Oil and Gas Journal, Tulsa, Oklahoma.

PRESSURE GAUGES AND POWER METERS

Reconditioned, recalibrated and guaranteed

1—12" diameter face pressure gauge	Range 0—250#
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2—6" diameter face pressure gauges	Range 0—300#
1—6" diameter face pressure gauge	Range 0—200#
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2—5" diameter face pressure gauges	Range 0—500#
1—5" diameter face pressure gauge	Range 0—250#
2—Type D-14 G. E. power meters	50 Amp., 220 volt
4—Type D-7 G. E. power meters	150 Amp., 220 volt
2—Type D-7 G. E. power meters	100 Amp., 220 volt
2—Type D-7 G. E. power meters	50 Amp., 220 volt
1—Type D-7 G. E. power meter	5 Amp., 220 volt

Refinery Equipment Inc.

W. C. Berry
Union Ave at 21st St.

Robt. W. Duden
Tulsa, Oklahoma

FOR SALE—Brand new taper tapped recessed Line couplings as follows: 3000 2" 11½ thd; 1000 2½" 8 thd; 1000 2½" 11½ thd; 2500 3" 8 thd; also following API Seamless Steel Couplings removed from new pipe and good as new: 200 6⅝" OD x 9" long 10-V thd. Subject prior sale. Wire collect for low prices. VALLEY STEEL PRODUCTS CO., St. Louis, Mo.

FOR SALE: One 175 HP 1800 RPM gas engine with clutch in good condition equipped for using natural gas if desired Wallace, 915 SE 29, Oklahoma City, Phone 2-6715.

FOR SALE: National Drilling Machine No. 2, in excellent condition and now running. With or without motor and reverse clutch. New wood mast, fiber friction and beam. Calf-wheels. Box 247, Owensboro, Kentucky.

FOR SALE: 500 Tobey A inverted domestic gas meters. THE ACME FOUNDRY & MACHINE COMPANY, Coffeyville, Kansas. Phone LD-7040.

FOR SALE: 2200 Ft. lead covered wire; 3 conductor 4-00 and smaller sizes; 50% new price. 16 VP AC 220-440 3 hp. 3600 Rpm motors; 50% new price. 18 Sharples Centrifuges; 10% new price. Other equipment. Box 610, Mt. Pleasant, Texas.

TWO—6½" x 12" Ingersoll-Rand Gas compressor cylinders for style XVG Gas Compressor #4AV113, complete wtih piston, piston rod, metallic packing, complete set of valves and one hand operated inlet valve unloader. Cylinders designed for 400 lbs pressure per square inch. Binghampton Gas Works, Binghampton, New York.

I am pulling 34 deep wells and am offering Jones No. 7 sucker rods ⅝, ¾, ⅞, and 1 inch in truckload lots at about one-half of new price. Also have about 1,000 ⅞ case hardened sucker rod boxes.

M. R. TRAVIS
1703 S. Boulder 2-2447 Tulsa, Okla.

RAILWAY EQUIPMENT AND ACCESSORIES

We can furnish rails, spikes, bolts, angle bars, locomotives, cranes and other railway material. Also Motors, heavy duty Write, wire or phone for prices

SONKEN-GALAMBA CORP.
106 N. 2nd St. Kansas City, Kansas

FOR SALE

50,000 ft. 4" O.D. 6# Reuseable Steel tubes, strictly #1 plain end beveled, welded in double random lengths, clean inside and outside.

6000 ft. 6" Std. Black Pipe P.E. beveled.

6000 ft. 6" Std. Black Pipe T&C strictly #1.

2500 ft. 5⅝ O.D. 15# Tubing, #1 Reuseable plain end beveled, welded in double random lengths, clean inside and outside. Also many additional items of reuseable new, excess and surplus pipe and tubing.

SONKEN-GALAMBA CORPORATION
Kansas City (18), Kans.

FOR SALE: 5,000' 4½" OD 16.60# Range 2 drill pipe with regular tool joints; 6,100' 4½" OD 16.60# Range 2 drill pipe with A.P.I. F.H. tool joints. Also 1 steel drilling rig complete with boilers and drill pipe capable of drilling 6,000'. Wire, write or phone Louisiana Iron & Supply Co., Shreveport, La.

FOR SALE: At Oklahoma City, 6500'—8" OD 8-V Thd., 40# Old A.P.I.-C Used S.S Casing, price of $2.00 per ft Cities Service Oil. Patridge, Bartlesville, Oklahoma.

2900' #0000, 600 volt, single conductor, electric cable: 10,000' #2, 3 conductor, armored electric cable: 5 ton telephone & communication wire. Leonard Smith Co., 520 S. E. 29th, Okla. City, Okla. Ph. 3-4112.

STAR Machine "30". Keystone Spudder 750' capacity. Full Standard cable outfit, engines, boilers, tools. Everything in cable drilling equipment. Write S. W. Pressey, Pueblo, Colorado.

FOR SALE: One Portable Drilling Rig for 3,500 foot drilling, Wichtex Draw Works, 65 foot 8" Mast Poles, 7¼ x 10 Gardner-Denver Pumping Unit with 165 hp. Buda, 3,500 feet full hole drill pipe. Robertson Drilling Co., Panhandle Building, Wichita Falls, Texas. Phone 5708.

POWER ROTARY RIG FOR SALE
(For shallow drilling)

DRAW-WORKS is roller bearing, brakes are 36" diameter and 6" wide. FRICTION CLUTCH is in drum. MOTOR is 6-cylinder heavy duty truck (Dodge 2-ton) motor with 5-Speed-Forward TRANSMISSION. Motor is 1942 model purchased new this year, has combination gas or gasoline carburetor. DERRICK MAST is 10" pipe with built-in CROWN BLOCK, 64' high. TRAVELING BLOCK has 3-sheaves and 5' SPRING HOOK. Rig has Boykin Rotary Table and Oilwell SWIVEL.

MUD PUMP is Gardner-Denver 7¼ x 10, unitized on heavy steel skids, with V-Belt Drive to heavy-duty 4-cylinder CLIMAX engine.

KELLY is 4½" square, about 34' long, equipped with DRIVE BUSHINGS for rotary table.

PRICE for all above items . . . $13,500.00 at present location, Northwest Palo Pinto County, Texas. A. W. ADKISSON, 2018 W. T. Waggoner Bldg., Ft. Worth 2, Texas.

36-L BUCYRUS-ERIE FOR SALE

Have 2 Bucyrus-Erie 36-L Spudders for sale. These machines are in first-class running condition and are working on top to bottom jobs at the present. Each rig is fully equipped with big-hole tools down to 5-inch hole tools. Equipment also includes wire lines, dog house, light plant, water tank, crane and chain hoist, forge and blower, floor tools, etc. You can take these rigs and equipment and handle any type job including work-over and drilling-ins. Rigs are semi-trailer mounted on rubber. These rigs can be seen in operation in northern Indiana. If interested phone 1059, Salem, Illinois, or write to Fred DeMier, 219 West Church, Salem, Illinois.

TEN sixteen-inch by twenty-inch Cooper-Bessemer Power Cylinders with cylinder heads, pistons, rods and new piston rings. $325.00 each. Some rebored, some relined. Located our plant, Overton, Texas. The Parade Company, 1308 Commercial National Bank Bldg., Shreveport 82, La.

FOR SALE: Complete modern refinery, 2000 barrels topping capacity, 600 barrels cracking capacity, complete with Ethyl plant, treating, storage, railroad siding, truck loading docks. Shelly Refining Co., Inc., P. O. Box 1191, Bay City, Texas.

OIL WELL INSTALLATION FOR SALE in Wabash County, Illinois. Has 2500 feet 5½-inch casing, tubing, rods, pumping jack, new 40 H.P. gas engine, two 250-barrel steel tanks and a vacuum. Will sell as is or separate equipment. For inspection see Con Sheridan, St. Francisville, Illinois. Franz W. Fackler, 1060 Consolidated Building, Indianapolis 4, Indiana.

TRADE: Buckeye model 12 ditcher for small backhoe, sideboom tractor, bulldozer, tow cats or Lincoln engine driven welders. Somerville Construction Co., Ada, Michigan.

25 H.P. Type "Y" Fairbanks-Morse Diesel engine. Good condition. C. B. Lewis, Palmyra, Wisconsin.

RADIATORS

ALL MAKES OF ENGINE COOLERS—AUTOMOTIVE, DIESEL AND INDUSTRIAL RADIATORS
Cleaned — Repaired — Recored
Now able to furnish copper cores on all types of radiators

FRANKS RADIATOR SERVICE
1513 E. 11th St. Phone 3-3820
Tulsa, Okla.

EQUIPMENT WANTED

EQUIPMENT WANTED

Wanted: Drilling Rigs, complete, in good operating condition, one suitable for 6,000' hole and one good for 4,000' hole. Send inventory and price. Box 2831, Custom House Station, New Orleans, La.

WANTED: Rotary shot-hole drill, Failing No. 500, Engineering Labs. or equivalent type. Present condition not of primary interest as repair facilities available. Box A-323, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED: Used Model E or M Allis-Chalmers Cooper Pulling Machine. Write or wire price, description. S. W. Swenson, Box 597, Shelby Montana.

WANTED

Unlimited quantity of
Structural Steel — Pipe — Tubing
Casing and Valves, all sizes

SONKEN-GALAMBA CORP.
Kansas City (18), Kansas

LEGAL BLANKS

THE BURKHART LINE of Legal Blanks Since 1908. Oil-Gas and Business Forms for Mid-Cont. and Illinois Basin. Leases Rev with Gov.'s Regulations. Catalog and Samples. Burkhart Ptg & Sta. Co., 115 So. Cincinnati, Tulsa, Okla.

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The Philtower
Tulsa, Oklahoma

REAL royalty profits are made AHEAD of the drill, while prices are low. We sell only on major oil company wildcats, or on undrilled acreage in fields in which discovery well has been drilled. Write for booklet "J". Landowners Royalties Company, Great Falls, Montana.

We Offer:
PRODUCING OIL ROYALTIES
Oklahoma—Kansas—Texas
Send for our offerings—no obligation.

TELLIER & CO.
12 Broadway, New York 4, N. Y.
Established 1931

FINANCING

CAPITAL SEEKERS—Interested in raising $25,000 or more for a legitimate project should write to AMSTER LEONARD, Fox Theater Bldg., Detroit 1, Mich.

PRACTICAL oil man with executive ability wants connection with responsible individual or organization in position to raise money for oil development in Wyoming and Montana; strictest investigation invited. Box 531, Billings, Montana.

PATENT ATTORNEYS

PATENTS, Trade-Marks, Booklet, "General Information Concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 418, Bowen Bldg., Washington 5, D. C.

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Bureau of Mines Report on Thermal Expansion Ready

WASHINGTON. — The report of U. S. Bureau of Mines on "Thermal Expansion of Pressure Samples of Hydrocarbon Liquids From Gas-Condensate Wells" (Investigation 3772) is now ready, the bureau announces. The report, prepared by R. V. Smith, M. A. Schellhardt and E. J. Dewees, includes description of apparatus used, laboratory procedure followed, and discussion of data obtained from a study of the thermal expansion (from 60° to 160° F.) of 13 hydrocarbon liquids under pressure. The saturation pressures of the liquids ranged from about 200 to 2,000 p.s.i.a. at 160° F.

Three of the liquids were taken from the separators in the Grapeland and Opelika fields and are designated initial samples in the report. The 10 other liquids were formed by progressive reductions of the saturation pressures of the initial separator-liquid samples by differential liberations of part of the dissolved gases, and are referred to as reduced liquids.

The investigation included studies of physical characteristics of the different liquids and effect of pressure in general upon thermal expansions of the initial samples and their reduced liquids. Also discussed is the thermal expansion of saturated liquids and that of liquids under a series of constant pressures equivalent to or higher than their saturation pressures under the maximum temperature of the tests.

Principal divisions of the 23-page report, which includes 17 figures, are general statement of work, apparatus and experimental procedure, properties of the separator liquids, experimental data and analytical procedure, and application of thermal-expansion data to gas-condensate recovery problems.

C.I.O. Selected by Texas Co. Employes

HOUSTON.—The Oil Workers International Union, affiliate of the C.I.O., has been selected by a majority of production and maintenance employes in the producing department of The Texas Co., South Texas division. Election was conducted by mail on November 23, and the vote was 176 for the union, and 129 against.

MARKET QUOTATIONS

Prices as of January 2, 1945

(This service is abbreviated because most refinery products are selling at the Government's price ceilings. Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gallon.)

REFINERY GASOLINE

Octane (A.S.T.M.)	76†	70-74
Mid-Continent*	6.75	5.87½
Gulf Coast	6.75	5.83½
Northeast Coast	...	5.87½
California	...	6.50-7.00

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	26-70	18-34
Oklahoma (Group 3)	4.750	5.700
North Texas (Dist. 1 Del.)	4.500	5.400
North Texas (f.o.b. plant)	4.375	5.250
North Louisiana (Dist. 1 Del.)	5.160	6.060
North Louisiana (f.o.b. plant)	4.375	5.250
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl.	
East Texas	$1.23
Conroe	1.41
Tepetate, Louisiana	1.13
Illinois basin	1.27
Pecos County, Texas	.96
Bradford, Pennsylvania	3.00
Van, Van Zandt County, Texas	1.00

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity:	Signal Hill, Calif.	Okla-homa, Kansas	Gulf Coast Texas	West Texas*
18-18.9	$0.80	...		
19-19.9	.84	....	$1.08	$0.70
20-20.9	.88	$0.85	1.09	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	....	1.07	1.30	.94
32-32.9	....	1.09	1.32	.96
33-33.9	....	1.11	1.34	.98
34-34.9	....	1.13	1.36	1.00
35-35.9	....	1.15	1.38	1.02
36-36.9	....	1.17	1.40	1.04
37-37.9	....	1.19	1.42	1.06
38-38.9	....	1.21	1.44	1.08
39-39.9	....	1.23	1.46	1.10
40 and above	....	1.25	1.48	1.12

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended December 23, 1944

(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks: Gasoline	Stocks: Distillate	Stocks: Residual
East Coast	607	12,543	10,899	7,577
Appalachian	156	4,285	728	563
Ill., Ind., Ky.	802	17,706	6,377	3,264
Okla., Kan., Mo.	371	7,975	2,299	1,526
Inland Texas	232	2,779	393	624
Tex. Gulf Coast	1,147	14,840	6,718	9,120
La. Gulf Coast	262	4,358	1,777	1,172
North La.-Ark.	69	2,401	563	237
Rocky Mt.	120	1,683	372	534
California	836	14,795	10,720	33,902
Total 12-23-44	4,682	83,365	40,846	58,509
Total 12-16-44	4,537	82,747	42,413	59,280
Total 12-25-43	4,204	73,019	43,033	57,036

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
December 23, 1944	222,575,000
December 16, 1944	222,075,000
December 25, 1943	241,310,000

*Excludes unrefinable California stocks.